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CONTENTS

VOLUME 69 **FEBRUARY, 1941** *NUMBER 2*

	PAGE
Editorial	33
Molding Large Diesel Engine Crankcases *By Edwin Bremer*	34
Test Hot Strength of Molding Sand *By N. J. Dunbeck*	39
A.F.A. Plans New York Convention	41
When Time Is Essential, Light Up *By Robert W. Morris*	42
Foundry Progress Aids Nation's Defense Effort	44
Gating Nonferrous Castings Is Important *By N. K. B. Patch*	46
Questions and Answers	48
Men of Industry	54
The Adventures of Bill *By Pat Dwyer*	60
Activities of Foundry Groups	65
Foundry Developments at Short Range	86
Prevents Repetition of Errors	89
Industrial Hygiene Surveys Have Many Benefits *By John F. McMahon*	92
Among Detroit Foundries *By A. H. Allen*	94
Comment	96
Foundry Activities	97
New Foundry Equipment and Supplies	98
Malleable Annealing Is Based on Composition *By Richard Schneidewind*	103
Obituary	106
Abstracts from World Literature	119
Foundrymen and Metallurgists Co-operate to Advance Industry *By Vincent Delport*	121
Where-to-Buy Directory	125
Reviews of Manufacturers' Literature	139
Index to Advertisers	156

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THE FOUNDRY

EDITORIAL

Industry Needs Joint Effort In Handling Defense Work

ORGANIZATION of the Office of Production Management for National Defense and President Roosevelt's fireside chat and message to the new congress, at last brought the American people to the realization that the Nation's defense effort takes precedence over every other activity. The previous philosophy of "business as usual" rapidly is being discarded and the entire energies of the country soon will be devoted to the defense program.

In the days immediately ahead the foundry industry will be confronted with many problems which can be solved only through action at Washington or by some local or district agency. At present such contact is being made by individual companies or by organizations representing various groups. Much duplication of effort and some unintentional competition results. For the immediate future, the foundry industry needs a committee, composed of leaders in every type of foundry organization, to handle overall policies of castings manufacture as it relates to defense work. Scope of such committee might not be as wide as the War Service board of 1917-18, but its activities would serve both government and producers of castings.

Why Not Exhibit Castings?

ENTIRELY too many engineering designers are not at all familiar with the wide range of physical properties available in the field of ferrous and nonferrous castings. In spite of publicity efforts of numerous individual companies and several national groups, the presentation of modern castings data in recent editions of a number of engineering handbooks, and the publication and rather widespread distribution of such valuable data books as the *Cast Metals Handbook* and the *Steel Castings Handbook*, the exceptional properties offered by castings are not sufficiently well known.

What further steps should be taken in this educational program? One suggestion, recently made by Leon J. Wise, manager of industrial sales, Chicago Malleable Castings Co., Chicago, is as follows:

We recently developed a cast metal of exceptional merit, at least in our opinion, which has an unusual combination of physical properties. Of course we wanted to tell users of castings about it. The National Metals Exposition seemed the most logical place to introduce that material, so we became an exhibitor at the 1940 show and were successful in interesting a goodly number of people in our story. However, the fact was evident that the primary interest of those attending that exposition was not castings, but rather in steel treating and welding.

Why not a Foundry Products Exposition?

Surely the foundry industry in its various ramifications is big enough, important enough, and should be sales minded enough, to put on its own show—to tell the story of improvements in casting properties to the people who use or should use castings.

Several branches of the industry are doing some effective co-operative advertising through trade associations. The suggested castings exposition could well augment such advertising campaigns.

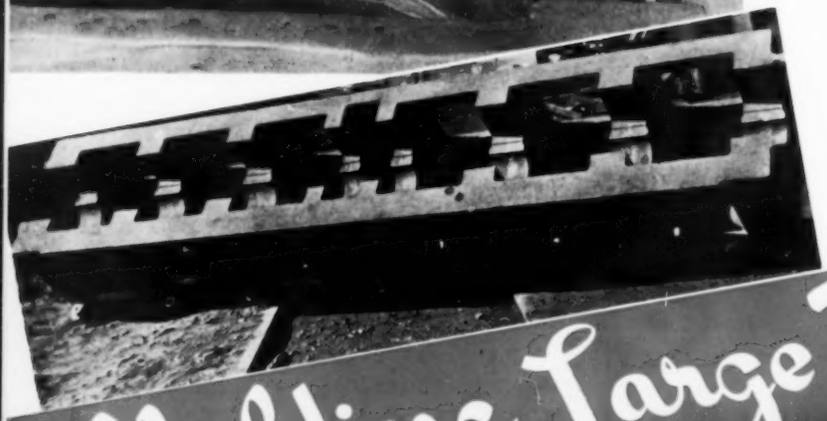
With the welding people doing plenty to take business away from foundries, we have got to wake up and defend the market for castings.

No user likes to think that he is buying the products of decaying industry. You can't stand still today.

During the past few years, a small number of exceptionally progressive foundries have maintained exhibits of castings at several industrial shows. In addition to attracting considerable favorable attention to their own products, these firms have contributed to the progress of the entire foundry industry through good publicity for a variety of cast materials. Several excellent castings exhibits have been included at recent A. F. A. shows, but these serve more to inspire foundrymen than to educate engineers. A much more elaborate display of castings than anything previously attempted was planned by C. E. Hoyt of the A. F. A. for the 1939 National Machine Tool Show, but that exposition was canceled shortly after the beginning of the war.

So we repeat the question raised by Mr. Wise—"Why not a Foundry Products Exhibit?" Such an affair, properly staged, should stymie much of the propaganda for other materials now being foisted upon the American public.

Frank G. Steinebach
Editor



..Molding Large Diesel Engine

EXPERIENCE gained by the Lake Erie Engineering Co., Kenmore, N. Y. in manufacturing hydraulic presses for over 50 years is particularly advantageous in producing dense, pressure tight castings for the jobbing trade. Castings used in the products of that company include various hydraulic press parts, such as housings, rams, platens, cylinders, etc. In addition to pressure tightness, these castings also must possess high strength. Jobbing castings produced by the company in weights from 1 pound to 75 tons used in the chemical industry, for diesel engines, for municipal use, and for other fields.

Until approximately 10 years ago the firm was located in Buffalo, N. Y., and at that time sold its land and buildings to make way for a railroad development. The company then moved to Kenmore, a suburb of Buffalo, where a modern building was constructed to house the foundry, machine shop and assembly departments. The

Fig. 1 (Above left)—Setting cores in the upper half of a crankcase. Fig. 2. (Left)—Finished casting forming lower half of crankcase ready for shipping. Fig. 3 (Below)—Flywheel mold after outside and inside faces of the rim or flange have been molded

Crankcases . . .

By Edwin Bremer

foundry section of the building, which is of steel sash and brick, occupies a main bay 255 feet long and 180 feet wide. In addition a side bay 27 feet wide is devoted mainly to making and drying cores. The gas fired core oven is 14 feet wide, 24 feet long with a height of 10 feet 6 inches. The side bay is served by two electrically operated cranes of 5 and 7 tons capacity.

The main bay is served by two 25-ton cranes and a series of jib cranes mounted on the supporting columns between the side and main bays. Melting equipment and mold drying ovens are located approximately in the center of one side of the main bay. The iron, which mainly is the alloy type containing nickel, chromium and molybdenum, is melted in either a 42-inch or 60-inch inside diameter cupola, depending upon the amount of metal required. In addition the firm has designed and constructed a special 20-inch baby cupola for melting niresist containing approximately 15 per cent nickel and 7 per cent copper, and nihard, an alloy containing about 4.5 per cent nickel and 2 per cent chromium.

Molds are dried in two large ovens of which one is 10 feet wide, 25 feet long, and 12 feet high while the other is 18 feet wide, 25 feet long, and 14 feet high. Both mold and core drying ovens are gas-fired, but are equipped with interchangeable burners so that within a few minutes time they may be converted into oil burning units. Unusual feature relative to gas burning is that the Lake Erie Engineering Co. has its own gas wells supplying an ample flow of fuel for foundry and other purposes. Another interesting feature is that the large castings are cleaned by hand outside in the open air as shown in Fig. 7. All facing sand for molding is mixed on a sand mulling machine made by the National Engineering Co., Chicago. That device also is employed for mixing the core sand. Molding sand is cleaned and reconditioned in a sand conditioning machine supplied by the Beardsley & Piper Co., Chicago.

Fig. 4 shows a general view of the core room, and gives an excellent idea of the method of making cores and the wide range of core sizes made. Cores are made from a mixture of lake sand and a proprietary, linseed-base core oil. As might be expected the centers of large cores are filled

Fig. 4—General view of the core room showing method of making cores and the wide range of core sizes produced

Fig. 5 (Left)—View showing several steps in the molding of manhole frame castings. Fig. 6 (Above)—After the flat drag is made, the body pattern is placed in position over the coreprint holes, the gate sticks located, and sand is rammed under the coreprints along the lower part of the pattern

with cinders to insure ample permeability and collapsibility. The core oven previously mentioned is located at the end of the bay so that it easily is accessible. The sand conditioner and sand muller may be seen in left background of Fig. 4.

While the majority of the castings produced by the firm are made in cast iron flasks, the foundry floor contains a large pit for the construction of molds for manufacture of extremely heavy castings. The pit, which is concrete lined, is 18 feet wide, 40 feet long and 15 feet deep, and arranged so that steel bulkheads may be installed at intervals to obtain various size pits. Since most of the castings are large, they are shaken out where poured, the flasks and castings removed, and the sand transported by clamshell buckets to one end of the foundry for reconditioning. The prepared sand is carried to the molding floors in large wooden and cast iron boxes of approximately 1 cubic yard capacity. Facing sand similarly is transported.

Reverting to a mention made previously on applying skill and experience gained in making dense, strong, pressure-tight castings for its own specialty, to producing jobbing castings for other firms, attention is called to Figs. 2 and 11. These are the lower and upper halves forming the crankcase for a 6-cylinder diesel engine. The upper half, Fig. 11, weighs about 6 tons while the lower half, shown in Fig. 2, weighs about 8 tons. Patterns for these are combination type which may be used either for 6-cylinder or a 4-cylinder crankcase. The company also makes crankcases for 3 and 8-cylinder diesels from individual patterns. Study of the illustrations will indicate clearly the intricacy of the castings, and it hardly is necessary to

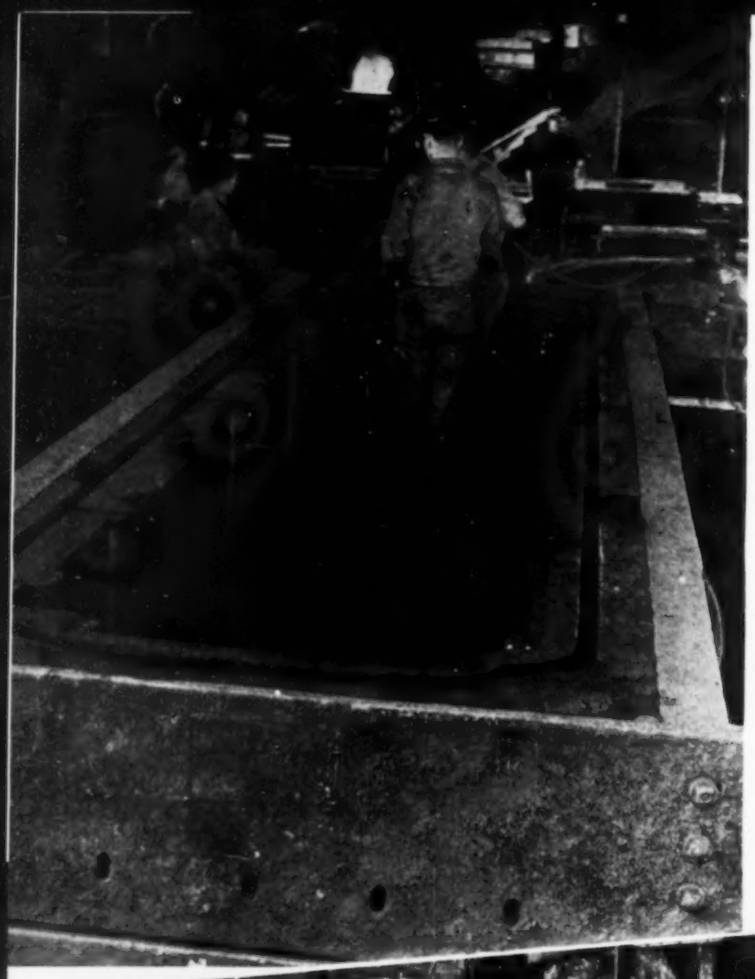
Fig. 7 (Above)—All large castings are cleaned by hand outside in the open air. Fig. 8 (Right)—Flywheel mold in process of construction showing appearance after bed is swept up and some of the arm cores in position

point out that freedom from porosity and high strength are essential to avoid oil and water leakage, and to withstand impact and other stresses occuring during operation.

The lower half crankcase is molded so that the oil pan is in the cope, and all the cores are bolted securely through the drag mold. In addition all vents from the cores are taken off through the drag. The result is that only two chaplets are required, one at each end of the mold to hold the cores down at that location. Similarly in the case of the upper half of the crankcase, only two chaplets are needed. At this point it might be well to digress from discussing individual features, and proceed to describe the complete molding operation followed in making a lower half crankcase.

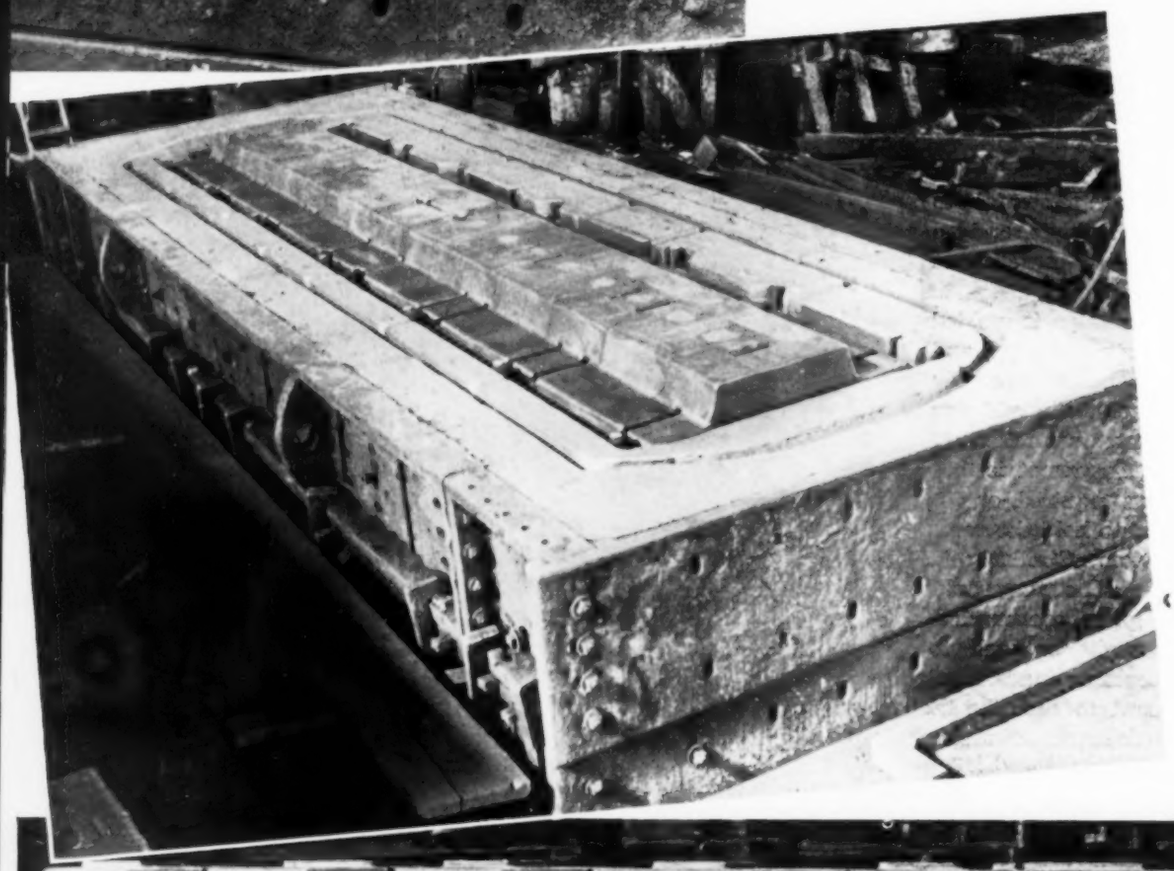
The lower half case is about 16 feet 6½ inches long, 46 inches wide and 36 inches high. As previously mentioned, the finished weight is approximately 7 tons. Flasks are 5 x 18 feet, and as may be observed from the several illustrations are of varying depths. The drag and cope flasks are about 12 inches deep while the cheek is comprised of two 18-inch flasks clamped together. First step in molding is making the drag which is rammed up with a perfectly flat surface. After striking off the surface, the pattern is set in position as shown in Fig. 6 to make impressions of the core prints on the under side of the pattern. The pattern is removed, and then the sand is cut out for the prints. Following that operation the face of the drag is nailed carefully to prevent any possibility of the sand cutting or scabbing, and the drag is put into the mold oven to be dried overnight.

After drying the drag is taken from the oven



and placed over a pit in the foundry floor to facilitate the later operation of bolting down the cores. The next operation is placing the pattern in position over the core print holes previously mentioned, as shown in Fig. 6. The gate sticks are located at each of the four corners as may be observed in the illustration, and then molding sand is packed and rammed under the core prints clearly shown in Fig. 6. Just previous to that operation pieces of soft steel, strap-iron ⅛ x 1-inch, are formed carefully to the contour of the prints and held in position while the sand is rammed in place. Experience has shown that the iron straps form a strong, solid foundation in which the cores can be placed easily. The straps also insure firm, unbroken corners in those portions of the mold.

When sufficient sand is rammed under the prints to take care of undercuts, the first section of the cheek flask is set on the drag, and the sand is rammed with pneumatic rammers, in comparatively thin layers (*Please turn to page* 116)



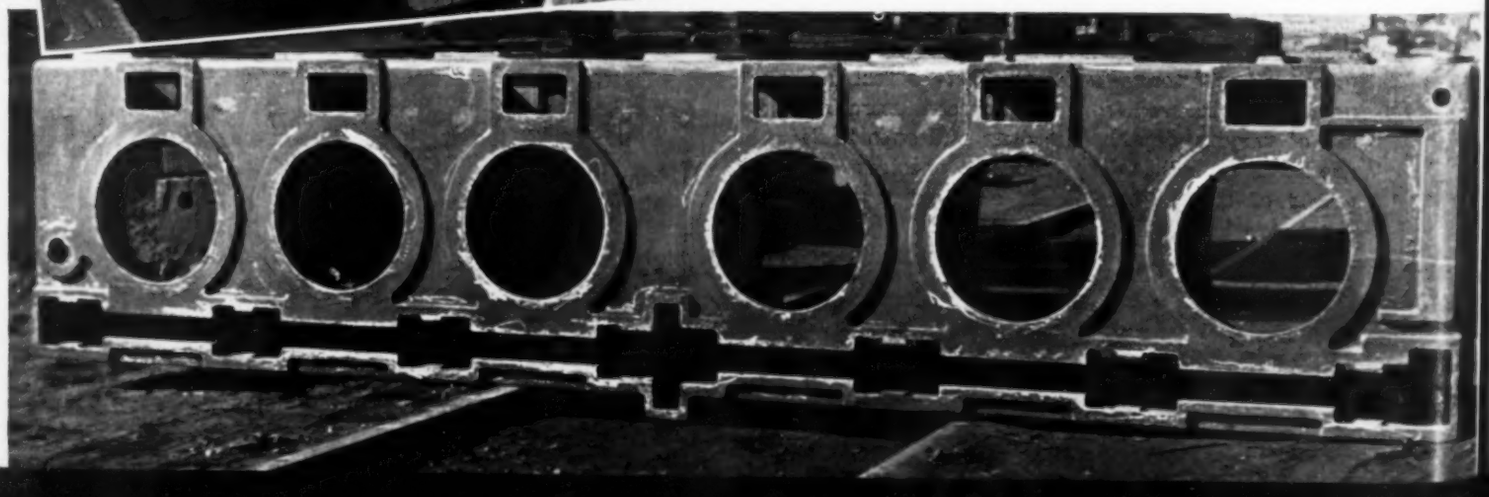


Fig. 9 (Above)—View of a crankcase mold after the body pattern has been removed, and some of the operations of finishing the mold face have been completed. Fig. 10 (Left)—Appearance of a crankcase mold with all cores in position. Joints between cores have been filled carefully to eliminate fins. Fig. 11 (Below)—Upper half of a crankcase ready for shipment

TEST HOT STRENGTH OF MOLDING SAND

By N. J. DUNBECK
Vice President
Eastern Clay Products Co.
Eifort, O.

PRESENT American Foundrymen's association dry strength test measures the strength of a sand specimen after baking for a definite period at 220 degrees Fahr. The test gives worthwhile information when test results are correlated with casting results. If, for instance, cutting or washing is observed with low dry strength, the dry strength can be increased until cutting stops and then the dry strength can be kept at or above the increased figure thereafter.

This seems a simple solution but unfortunately such correction will be successful on only that particular sand. A second sand may give no cutting with lower dry strength while a third sand may give cutting with much higher dry strength. The reason is that no relation exists between the dry strength and the hot strength of dissimilar sands and bonding clays. Casting results cannot be predicted from present dry strength test.

Since we pour molten metal, we necessarily are concerned with the strength the sand maintains at high temperature. If we can determine the hot strength behavior of various types of sands and bonding clays we can select more intelligently the materials to be used on any particular class of work.

Little information on hot strength is available to fundrymen. A comprehensive study of the subject is underway by a sub-committee of the A. F. A. sand research committee. Valuable information can be expected but the field to be covered is so large that much time may be necessary in completing the work. To at least get some preliminary information quickly, tests were run on individual bond clays, combinations of clays and combinations of clays with auxiliary binders. In these shock tests, the samples were tested for strength in the furnace, after brief exposures to heat, at the various temperatures indicated. This method may or may not be precisely correct but it does give information not previously available. As a matter of convenience, only the hot strength at 2000 degrees Fahr. will be discussed since this temperature gives the widest variation in results. Base sand throughout was Michigan City, average grain fineness 53.

Table I shows that 10 per cent of fire clay when properly tempered with 3.3 per cent water has a 2000 degree Fahr. hot strength of 295 pounds per square inch. When clay content is increased only 2 per cent to a total of 12 per cent with the slightly higher 3.5 per cent water content necessary for proper feel, dry strength in-

Table I

Changes in Quantity of Clay and Water

	Ohio fire clay	Ohio fire clay	Ohio fire clay
Bond per cent	12	12	10
Moisture	4.0	3.5	3.3
Permeability	85	87	103
Green Compression	8.5	10.5	8.7
Green Deformation	0.019	0.017	0.015
Dry Compression	71.5	52.0	47.5
Hot strength degrees Fahr	Pounds per square inch		
500	55	52	38
1000	100	85	60
1500	153	87	80
2000	550	400	295
2500	5	6	5

Table II

Western Bentonite and Ohio Fire Clay

Bond or combination	Western bentonite	75% W.B. 25% O.F.C.	50% W.B. 50% O.F.C.	25% W.B. 75% O.F.C.	Ohio fire clay
Bond per cent	5	5.2	6.8	8.5	10
Moisture	2.5	2.3	2.8	3.5	3.3
Permeability	167	162	154	116	103
Green Compression	9.6	9.1	8.7	8.8	8.7
Green Deformation	0.012	0.013	0.017	0.018	0.015
Dry Compression	83.0	75	125	120	47.5
Hot strength degrees Fahr	Pounds per square inch				
500	75	40	65	116	38
1000	74	65	100	160	60
1500	195	120	240	250	80
2000	490	560	830	1000	295
2500	8	5	6	8	5

Table III

Western Bentonite and Southern Bentonite

Bond or combination	Southern bentonite	75% S.B. 25% W.B.	50% S.B. 50% W.B.	25% S.B. 75% W.B.	Western bentonite
Bond per cent	4	3.8	4.3	4.8	5
Moisture	2.6	2.5	2.5	2.5	2.5
Permeability	178	180	171	160	167
Green Compression	9.9	9.6	9.8	9.8	9.6
Green Deformation	0.008	0.012	0.012	0.011	0.012
Dry Compression	47.0	42.0	59.0	69.0	83.0
Hot strength degrees Fahr.	Pounds per square inch				
500	21	31	38	43	75
1000	35	42	53	55	74
1500	30	70	160	175	195
2000	25	65	90	95	490
2500	3	4	5	4	8

creased only 9.4 per cent while hot strength increased 35.5 per cent. When the tempering water for 12 per cent clay is increased only 0.5 to 4 per cent both dry strength and hot strength increased a further 37.5 per cent. This indicates that with this particular clay, dry strength and hot strength are in general relation to each other in overtempered sands but not in correctly tempered sands. Previous to these tests, this sharp increase in hot strength with slight increase in clay content would have been thought improbable or impossible. Rapid increase in hot strength may account for cracked castings.

Table II shows the hot strength of mixtures of Ohio fire clay and western bentonite. It will be noted that combination of the two clays gave higher dry strength and higher hot strength than either clay separately. This is unusual and no similar increase was noted in testing any other combination of clays. Such combinations should have excellent application in the casting of large iron and steel castings.

Table III shows the hot strength of mixtures of western bentonite and southern bentonite. It will be noted that dry strength and hot strength increase with increased percentages of western bentonite. In using southern bentonite, its low dry and hot strength has sometimes caused cuts and washes. In using western bentonite, its high dry and hot strength has sometimes caused difficult shake out, excessive loss of sand and cracked castings. Common sense suggests that a mixture of the two may be used to give precisely the hot strength required and no more. This extends sand control into a hitherto untouched and troublesome field.

Table IV shows the hot strength of mixtures of Ohio fire clay and southern bentonite. Dry and hot strengths are in relation to quantities used and the same desirable control of properties through the use of mixtures is possible. If a durable, low cost fire clay is used these mixtures can be quite economical.

Interesting information is given in Table V upon the effect of auxiliary binders. A 1 per cent addition of corn flour to southern bentonite gave a great increase in dry strength but hot strength is still such as to provide a highly collapsible sand. The addition of 1 per cent of corn flour to western bentonite gave practically no addition to dry strength and a great reduction in hot strength. This indicates that some steel foundrymen who have added cereal binder to western bentonite for increased strength have not benefited much in that respect but have actually given themselves a more collapsible sand.

Both pitch and rosin give high dry strength when added to southern bentonite but moderate hot strength. The special dry strength binder is shown to give the order of dry and hot strengths delivered by such products. There always is conflict between desire for high dry and hot strength to stop washing, and moderate strengths to give collapsibility. It might be said that dry strength means nothing and that the casting depends upon hot strength. Also it can be said, that pitch often will stop washing before a gate although these tests show that the strength it delivers does not persist (*Please turn to page* 108)

Table IV

Ohio Fire Clay and Southern Bentonite

Bond or combination	Ohio fire clay	75% O.F.C. 25% S.B.	50% O.F.C. 50% S.B.	25% O.F.C. 75% S.B.	Southern bentonite
Bond per cent	12	9¼	6½	5	4
Moisture	4.0	3.7	3.2	2.6	2.6
Permeability	85	118	139	167	178
Green Compression	8.5	11.0	10.4	12.9	9.9
Green Deformation	0.019	0.015	0.015	0.012	0.008
Dry Compression	71.5	83.0	71.0	55.0	47.0
Hot strength degrees Fahr.	Pounds per square inch				
500	55	54	35	40	21
1000	100	59	50	48	35
1500	153	100	62	30	30
2000	550	450	238	85	25
2500	5	5	5	4	3

Table V

Effect of Auxiliary Binders on Hot Strength

Bond or combination	4 per cent Southern bentonite	4 per cent S.B. 1 per cent corn flour	5 per cent Western bentonite	5 per cent Western bentonite 1 per cent corn flour	4 per cent S.B. 3 per cent pitch	4 per cent S.B. 1 per cent rosin	8 per cent special dry strength binder
Moisture	2.6	3.6	2.5	3.5	3.5	3.5	3.5
Permeability	178	138	167	152	110	128	96
Green Compression	9.9	8.2	9.6	9.3	11.7	8.1	8.9
Green Deformation	0.008	0.034	0.012	0.027	0.013	0.012	0.009
Dry Compression	47.0	133.0	83.0	87	158	145	208
Hot strength degrees Fahr.	Pounds per square inch						
500	21	85	75	63	67	42	105
1000	35	48	74	50	144	45	148
1500	30	45	195	105	102	41	250
2000	25	65	490	280	160	96	830
2500	3	3	8	6	6	3	5

A·F·A PLANS NEW YORK CONVENTION

FOURTEEN technical committees of the American Foundrymen's association have been busy for some time planning details for the 37 sessions which have been scheduled for the 1941 annual convention to be held in Hotel Pennsylvania, New York, May 12-15. The opening session will take place on Monday morning, May 12, and the final technical meeting on Thursday afternoon, May 15.

The Metropolitan Chapter of the A.F.A., under the chairmanship of R. J. Allen, Worthington Pump & Machinery Co., Harrison, N. J., will act as host to the visiting members and guests and will arrange for plant visitation, ladies' entertainment and certain other special activities connected with the holding of a convention. The chapter has set up a convention committee which will be under the chairmanship of Sam Tour, vice president, Lucius Pitkin, Inc., New York, a director of the chapter, and past director of the association.

Technical program, papers and reports will stress developments of the industry which are of outstanding importance in the production of castings for the national defense program. As in connection with recent conventions, the program committee has given major attention to provide papers and discussions of particular interest to the executive, the engineer, the metallurgist and the operating foundryman. Sessions are being arranged to cover general developments in plant and plant equipment, foreman training, apprentice training, job evaluation and time study, safety and hygiene, refractories, sand research and foundry cost methods. The five divisions of A.F.A., namely, gray iron, steel, malleable, nonferrous and patternmaking, each will have its own schedule for the presentation of formal papers and discussion of papers and reports. Two shop course series are being developed covering fundamental shop practice in connection with the gray iron foundry and the control of sand.

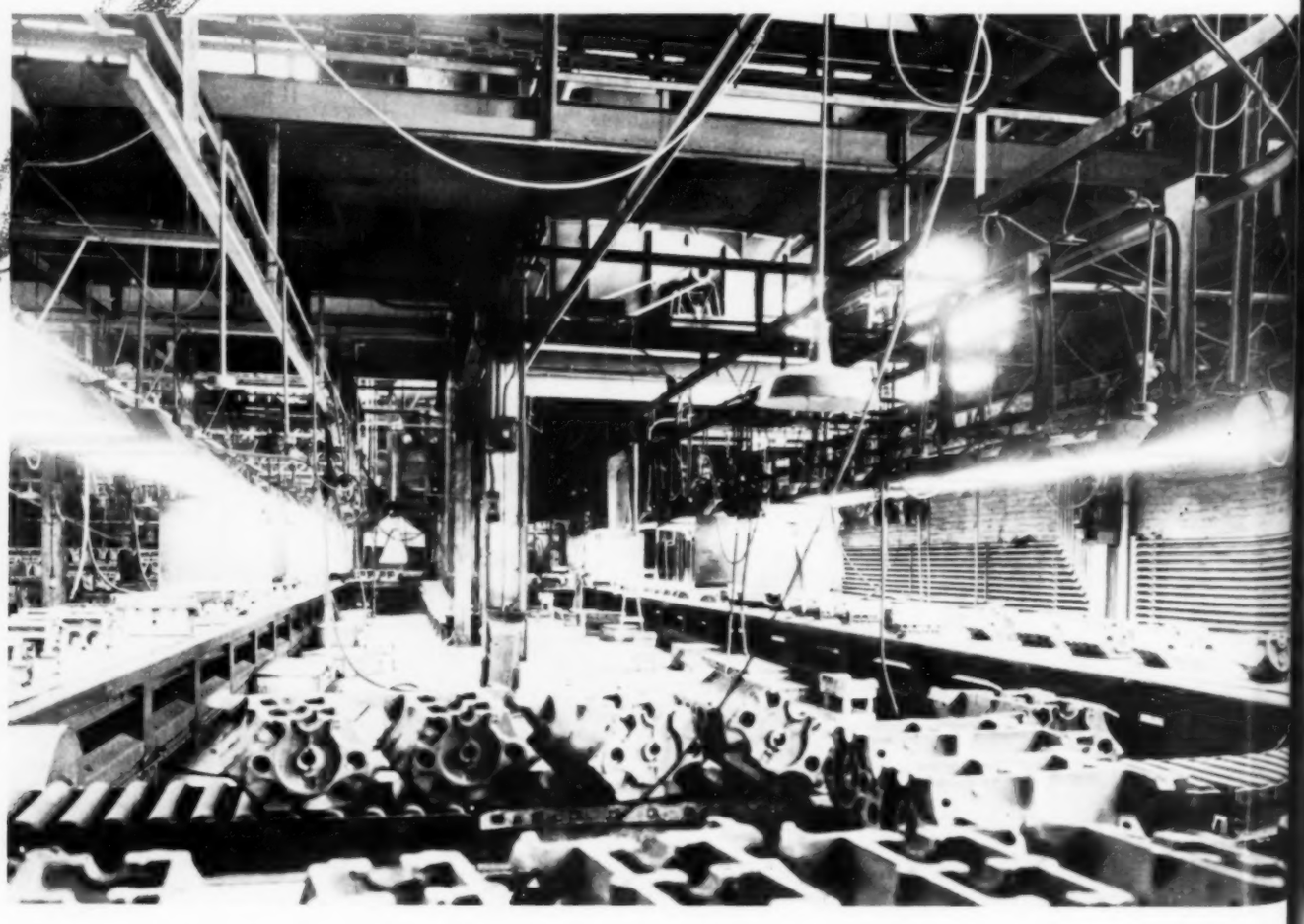
A feature of the convention will be the third annual lecture course which this year will be directed by Harry W. Dietert, president, Harry W. Dietert Co., Detroit. This lecture course will cover core making materials and practices. Many others throughout the industry are working with Mr. Dietert in contributing data for sections of the course which later will be published as a text and reference book for use of all those interested in core making.

Heading up the several program committees are the following chairmen: *Foreman Training,* A. D. Lynch, Young Radiator Co., Racine, Wis.; *Apprentice Training,* Franklin Farrel, III, Farrel-Birmingham Co., Ansonia, Conn.; *Refractories,* J. A. Bowers, American Cast Iron Pipe Co., Birmingham, Ala.; *Job Evaluation and Time Study,* F. E. Wartgow, American Steel Foundries, East Chicago, Ind.; *Plant and Plant Equipment,* W. R. Jennings, John Deere Tractor Co., Waterloo, Iowa; *Foundry Costs,* R. L. Lee, Grede Foundries, Inc., Wauwatosa, Wis.; *Safety and Hygiene,* E. O. Jones, A. F. A., Chicago; *Malleable Division Round Table,* J. H. Lansing, Malleable Founders' society, Cleveland; *Malleable Castings,* C. F. Joseph, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich.; *Steel Division Round Table,* R. S. Munson, Atlantic Steel Casting Co., Chester, Pa.; *Steel Castings,* T. N. Armstrong, International Nickel Co., New York; *Patternmaking,* Frank C. (*Please turn to page* 112)

WHEN TIME IS ESSENTIAL *Light Up!*

NOT long ago, when a large percentage of the country's foundries were idle or operating on limited production schedules, it was difficult to arouse much enthusiasm over good foundry lighting. Executives of the industry may have been willing to agree that good lighting possibly might speed production, that conceivably it might improve the quality of product, and that it might decrease spoilage and improve employe morale. But in those days money was scarce, there was no pressing need to speed production when orders were so meager, and the quality of product could be maintained by taking time to see that everything was done properly. Improved lighting was something that would be an excellent thing to have—later.

Today the situation has changed so completely that improving the lighting is something that cannot be postponed any longer. Instead of a few inconsequential orders in comparatively few plants a majority of plants are swamped with



Some 50 footcandles of high-quality supplementary illumination are provided on these conveyors by large-area diffusing units suspended 50 inches above the conveyor tops. Each unit contains two 200-watt filament lamps and the installation is in the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

orders of incalculable importance to the national defense program. Plants that less than a year ago were running one subcapacity shift now are operating 24 hours a day at full capacity.

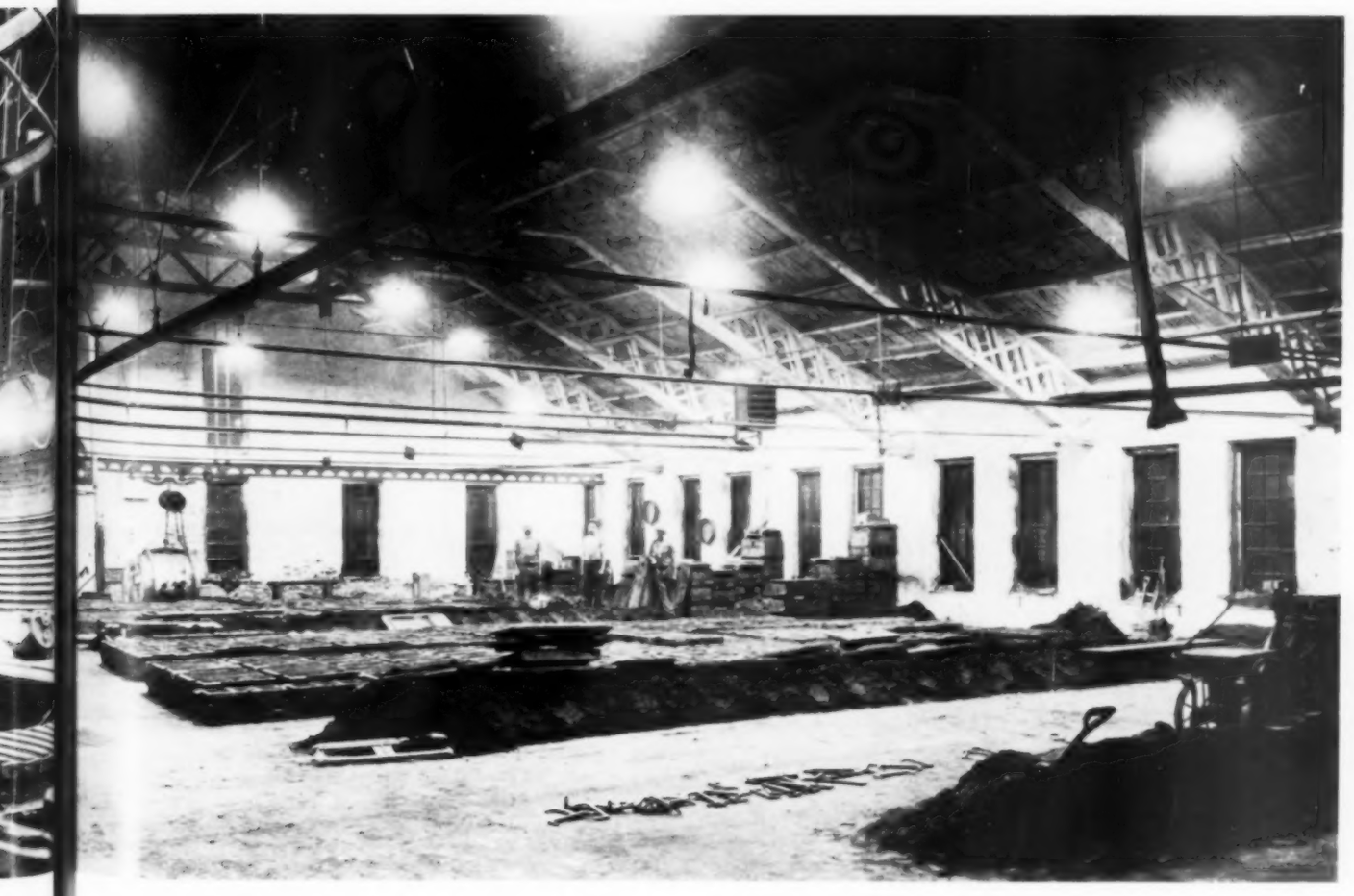
During the last war American industry learned the value of good lighting in stepping up productive efficiency. There was a job to be done and if good lighting could help to do it quicker and better the cost of the lighting was unimportant. Comparatively little attention was paid in those days to the quality of lighting because not so much was known about some factors that have since claimed the attention of the illuminating engineer. Today, lighting is considerably more of a science than it was nearly a quarter of a century ago, for much has been learned in the meantime. Let us see what sort of lighting the modern foundry requires in order to handle with efficiency and dispatch the huge volume of work that is now under way.

If there were one best way to light a foundry, one best type of lighting to prescribe, the problem would be simple. This is not to imply that there is anything particularly complex about the problem. But there are foundries of all shapes and sizes and there are several light sources which may be used. Sources include filament, mercury, and fluorescent lamps. Before discussing the considerations that govern choice of the light source, a few general observations should be made.

Most routine tasks in the foundry can be lighted satisfactorily with general lighting. Amount of illumination required varies with the difficulty of the seeing. Thus the usual minimum recommendations are 5 foot-candles for the charging floor, for tumbling, cleaning, pouring and shaking out; 10 foot-candles for rough molding and core making; and 20 foot-candles for fine molding and core making. A foot-candle is a unit of illumination, (*Please turn to page* 109)

By Robert W. Morris

General Electric Co.
Nela Park Engineering Department
Cleveland



Work in this section of Floyd Wells Foundry, Royersford, Pa., is performed efficiently under 25 footcandles of illumination supplied by 400-watt mercury lamps in spread type dome reflectors. The light walls help to reflect light to the work area

FOUNDRY PROGRESS AIDS NATION'S

NUMEROUS leaders in the foundry industry believe that technical and managerial progress during the past year will permit foundries in the steel, malleable iron, gray iron and nonferrous branches to render tremendous service to the greatest armament program ever undertaken by the United States. Because of developments during 1940 and several preceding years, the immediate future will introduce uses for castings where such applications are not even thought of at present.

Recently, the editors of *Steel* solicited comments from a number of foundrymen for publication in the Jan. 6 Yearbook of Industry issue of that publication. Since the comments cover considerable ground and point to past and future trends they should be of exceptional interest to readers of THE FOUNDRY.

Improved Cast Metal Properties Will Aid in Preparedness Program

By L. N. SHANNON

President
American Foundrymen's Association

IN THIS year, when a major portion of our national efforts are being devoted to preparedness, the foundry industry, through the extensive improvement in properties of cast metals and methods of production since the World war I, is in a much better position to aid greatly in the National Defense program. Great attention has been given to designing for castings, permitting advantage to be taken of increased engineering properties such as strength, wear and corrosion resistance.

In the cast iron field carbon control, heat

DEFENSE EFFORT

treatment and alloy use has boosted cast iron to a point where 50,000 to 60,000 pounds per square inch strength is being obtained consistently by many foundries. Development of special malleables such as the pearlitic malleables with tensile strength of 80,000 to 100,000 pounds per square inch and yield points of 50,000 to 65,000 pounds per square inch, have opened new fields of application. In the steel casting and nonferrous field, the developments of new properties and applications have been equally startling. In the steel casting field, the use of the converter is making an interesting comeback because of recently acquired knowledge of desulphurizing, and mechanical control of the conversion process through the use of the photoelectric cell, focused on the flame. Through use of alloys and heat treatment, steel castings are now available for practically any engineering requirements.

Equipment and methods for quantity production have more than kept pace with the developments in engineering properties as was shown so extensively at the May, 1940 Chicago exhibit of the American Foundrymen's association which brought together the largest gathering of foundrymen ever assembled. Through the work of the association, engineers are made aware of the possibilities of castings in engineering design as indicated by the publication this past year of the second edition of the *Cast Metals Handbook*.

Foundry Industry Makes Contribution To the National Needs

By OLIVER SMALLEY

President
Mechanite Metal Corp.

SINCE the beginning of the war in Europe developments in the foundry industry, as related to war conditions, production and new uses for castings, have been very rapid. Today the foundry industry is making its contribution to the national need, is assisting in the production of supplies of material and equipment, and, as far as possible, is maintaining essential labor, staff, and plant intact for post-war development. The relief offered thereby to other productive resources enables a more balanced national economy to be obtained.

It is particularly important that those responsible for progress in the national defense program, especially with respect to materials, recognize the part which the foundry industry can play in contributing to the effort. Modern foundries have accomplished much in the direction of continuous and mass production, in improvement of plant and equipment, in the establishment of technical control, and in the development of labor skill and good management. The industry also can offer greater precision of form in dimensions and design of castings as well as much better quality and greater uniformity. To suit requirements of a wide variety of structure, special processes of manufacture and finishes are available.

The expansion of fields for the successful application of castings during 1940 has been exceptionally wide. Specifically such castings are contributing to many important branches of direct defense work. These include: 1. The machine tool industry as a whole; 2. Shell forging and nosing dies and tools; 3. Drawing dies for all purposes; 4. Gear wheels and their extended application to the general engineering industry, permitting longer life and less noise; 5. Diesel engine and shipbuilding construction; 6. Bomb and shell castings.

The torch hardening process of surface hardening castings has seen such rapid growth that today it is not only in common use in almost every phase of engineering construction but is being applied successfully to roll manufacture, replacing the old type of chilled iron roll.

The casting industry as a whole has been and still is working for closer tolerances, high physicals, absolute freedom from flaws and greater dependability of product. The trend was well established before the war and care must be taken now to prevent the rush of present circumstances from resulting in a sacrifice of quality, remembering that the industry still has far to go to establish itself on a sound basis.

All Foundries Prepare for Defense Production Requirements

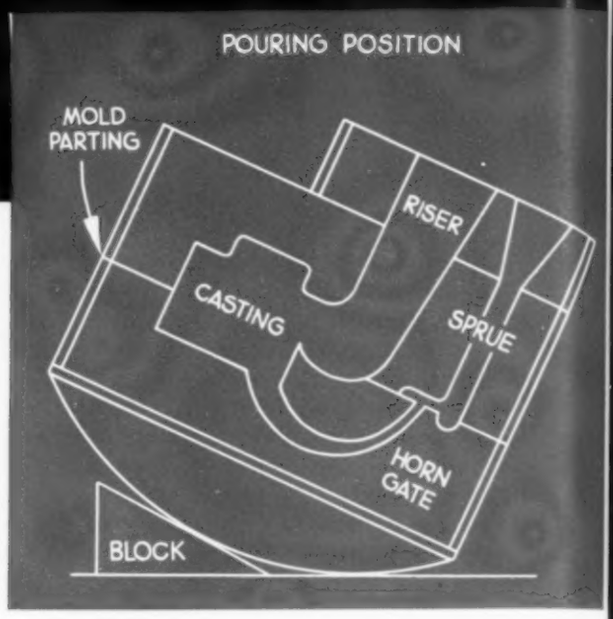
By P. J. POTTER

President
Foundry Equipment Manufacturers' Association

THE year 1940, especially the latter half, has been a period of preparation with foundries and foundry equipment manufacturers getting ready for the production requirements of our defense program for 1941 and 1942, in which ferrous and nonferrous castings have an important part.

Foundries for steel, malleable, gray iron and nonferrous castings re-equipped and enlarged, are swinging into (*Please turn to page* 113)

Gating



ONE fundamental factor in gating castings concerns the correct location of the gates so that the metal enters the mold where it will produce the largest number of good castings. In other words, the gate must insure a maximum effectiveness in filling the mold without causing any trouble. A number of factors influence the choice of the location of the gate or gates. Theoretically, the most desirable location for gates is where this causes the least amount of damage to the mold cavity formation.

Metal Tears the Sand

Obviously, the shaping of an intricate casting means that the mold cavity must have many accurately formed walls and angles frequently joined by fillets or corners, as the case may be. All of these must be maintained in their original form if the resulting casting is to be true to pattern. If metal rushing into the mold from the gate tears or abrades any of these surface corners or filiets, the resulting casting will be distorted to that extent and may or may not be satisfactory to the consumer. The best castings are those which are so uniformly true to pattern in every respect that they will fit jigs accurately without undue or expensive preparation for that operation.

Another important factor in the choice of the location of the gate concerns the number of gates that must be provided to insure the proper filling of the mold cavity. Choice between one or more gates depends upon the mass of metal to be fed into the mold and whether the casting has thick or thin sections, requiring slow or rapid filling. Where multiple gates are used, they must be proportioned so that there is a quiet flow from each and yet the main runner to these gates is of such proportion as to supply enough metal to keep all of the gates filling at the desired speed.

If a large amount of metal must enter a mold cavity and a large gate is likely to cause trouble, it is much better to use several smaller gates so proportioned that they do not produce a squirting or nozzle effect, but at the same time have a combined capacity sufficient to fill the mold at the desired rate. Multiple gates must be located so that the several entering streams will be knit together properly when they come into contact and will not result in agitation which produced drosses or slags or scum spots in the casting.

Riser Is Last To Cool

Providing entrance of the metal at the point where the proper heat gradient will be present with respect to the casting and riser as the casting cools is a third factor in the choice of the location of gates. In other words, since it is necessary that the riser shall be the last to cool in order to supply fluid metal for feeding up to and including the last moment, the gates must be such that the part of the casting furthest from the riser cools first and the remainder of the casting cools progressively as it approaches the riser, the last part to cool.

That is particularly true in the case of metals known as high shrinkage compositions. It also should be considered in producing castings of

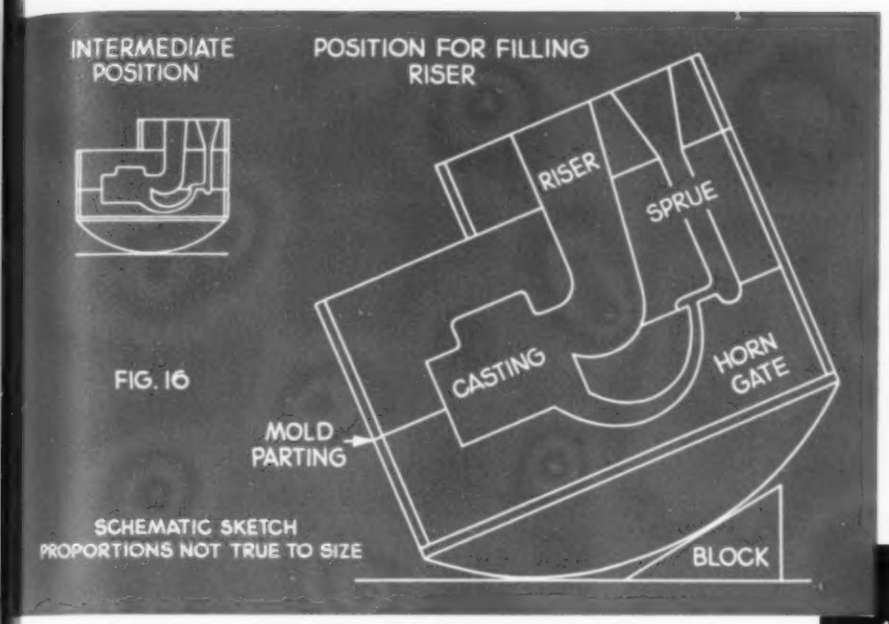


FIG. 16

By N.K.B. Patch

the other common brass foundry alloys which generally are accepted as not needing much or any feeding. That is a definite error proved by the results of pouring test bars and the subsequent testing of these bars. Test bars properly fed invariably show improved results in the physical properties resulting from feeding. Therefore, it is obvious that castings which have been fed properly will show improved characteristics resulting from the feeding.

Gradient Influenced by Temperature

There are a number of ways in which control of the heat gradient is influenced by foundry practice. Of course, they all come back to the location of the gate or gates. However, along with the location of gates other factors are introduced today by foundrymen to insure the correct progression of cooling of castings. One very powerful influencing factor is the location of chills so as to establish definitely that part of the casting to cool first. By careful application of that principle with the proper location of the gate with respect to the chills and riser, a progressive cooling may be developed that closely will approach the desired results.

Another practice is that of pouring the castings in one position and then as the mold cavity fills, rocking the mold or changing the position so that when the mold with the riser finally is filled, the riser is on top and contains the hottest metal as is illustrated in Fig. 16. As shown in the first or pouring position, the gates are located so that the riser is not necessarily on top. However, when the mold is in its final position the metal is forced by gravity to a definite position in the mold so that the furthest from the riser is the first to cool. While a number of complications arise in connection with that method of influencing the progressive cooling of castings, it is in common use where size and complicated character of the casting are such that practically no other method will produce proper progression of cooling and consequent effectiveness of the feeding heads.

Rapidity of production is another consideration in the question of location of gates. The problem is influenced by the need for mass production at low cost, and often results in a compromise with the ideal condition. Frequently it is possible to overcome the necessity for a compromise with the ideal location of gates by the use of a core in which the gate is located. The core is rammed into place during molding and while it may slow up mass production to some extent, the delay is more than compensated by the increased quantity of good castings per unit of production and the satisfaction to be derived from the use of the resulting castings under service conditions.

Such provisions for proper location of gates by use of cores also may suggest the use of the latter for the proper location of feeder heads, and yet make it possible for the patterns to be used on molding machines at a maximum operating speed. That will result in mass production of castings at low cost and yet have the casting properly fed and, therefore, of a high order of quality when considered from the standpoint of metallurgical characteristics resulting from correct feeding.

Sound castings cannot be produced if the gating is wrong, except by accident. In other words, there may be some of the castings accidently good, but too large a proportion of them will be bad if the gating is incorrect or the gates have been located improperly. Therefore, the size and location of gates becomes an important consideration worthy of the most careful planning and study by those responsible. Each of the different factors enumerated must have full consideration when these plans are under way.

Furthermore, gating (*Please turn to page* 107)

Questions and Answers

Has Trouble with Embrittlement After Galvanizing Malleable

Do you know of any book devoted to the subject of galvanizing malleable castings? We are looking for information on the cause of embrittlement and the proper preventative measure to adopt where malleable castings are galvanized by the hot-dip process.

We do not know of any book devoted exclusively to the subject of galvanizing malleable iron castings. On several occasions THE FOUNDRY has presented articles dealing with equipment and methods. For example an article in the March 15, 1926 issue described a method of heat treatment developed by a prominent Mid-west foundry to prevent malleable iron castings from cracking during the galvanizing process. Other articles on hot dip galvanizing appeared in the issues of July 1, 1929; January and February, 1934.

Reference to the use of copper was made by W. B. Sallitt at a meeting of the West Riding of Yorkshire Branch, Institute of British Foundrymen and is incorporated in the *Proceedings* of that association Vol. XXXI, 1937—1938, pages 740 to 770. He claimed that malleable iron is susceptible to intergranular embrittlement when held at temperatures of about 500 degrees Cent. (932 Fahr.) as for example in the galvanizing process. Therefore, in many instances it is necessary to precede galvanizing with a corrective treatment which consists of quenching from about 650 degrees Cent. (1202 Fahr.) However, the presence of copper greatly reduces this tendency to embrittlement and obviates the necessity for such preliminary heat treatment. In irons containing over 1.00 per cent copper the impact resistance after galvanizing is about the same as in annealed copper-free iron.

Quantity of Water in Molding Sand Is Based on Weight

In an article dealing with sand conservation and reclamation we note that a certain sand mixture contained 10 parts silica sand, 3 parts fire clay, 4 parts sea coal and 5 per cent moisture. Does this mean 5 per cent by volume, or 5 per cent by weight?

Moisture content of sand is based on weight. In testing sand for moisture content, the sample is heated until all moisture is driven off. By comparing the weights of the sample before and after drying the weight of the water is determined. In the operation of adding moisture to the sand the percentage figure is translated, since sand is weighed by the pound and water is measured by the gallon. According to United States standards a gallon of water weighs 8 1/3 pounds. Assuming that 1000-pound batch of sand requires the addition of 5 per cent moisture, the formula would be $1000 \times 0.05 \div 8.3 = 6.02$ gallons. Modern sand mixing devices are equipped with automatic measuring valves which may be adjusted to deliver the correct amount of water, other liquid or dry binder.

Gating and Temperature Changes May Eliminate Defects

We are having difficulty in producing what is known in the plumbing industry as a four valve fitting, and we are forwarding some of the castings, and sketches showing the method of gating. At one time we had only one of the fittings on a plate with some other small casting, but tried to increase production by putting on two. With the single casting, our losses ran around 6 per cent, while with the double plate, the loss ranges from 11 to almost 50 per cent. There are two main difficuities with the latter pattern. First we may have about 10 per cent of the valve ends crack open on running the tap into them. To overcome that, we deoxidized our metal with four times the usual amount of phosphor-copper, that is 7 ounces to 230 pounds of metal, and poured them at 2350 degrees Fahr. That led us into our second main difficulty, namely leakers due to sand holes. We have tried using a higher cope and lower temperature without results. We also have tried heavier gates, used three inlet gates at each end of the core prints on the gated end, while the core is flat in an attempt to get the metal to the opposite legs more quickly, but to no avail. Our alloy is 78 per cent copper, 1½ per cent tin, 9 per cent lead, and remainder is zinc.

While you are having enough trouble as it is with your present arrangement of two valve bodies on a plate, you are to be congratulated that you are not running into trouble from other sources than you mention. What we have in mind particularly is blow holes at those portions where the two castings are so close to each other. We believe that the 12 x 18-inch flask which you are using is too small to give the best results on two castings which have an over all dimension of 7½ x 8½ inches each. Evidently the method you indicate for venting is quite effective.

You mentioned that the reason for changing from a single to a double pattern was to increase production, but we cannot see where there is much gain since each pattern is poured individually the same as before. A real gain would have taken place if you would have

selected a flask say 22 inches long so that the patterns could be placed farther apart, and a central sprue with the necessary gates utilized to pour metal into both cavities at the same time. Incidentally, that would be gating the castings similar to the original way with the single pattern.

While you did not state definitely, the castings forwarded only show cracks on the valve ends opposite the gates. That indicates the metal arriving at those sections is too cold. This is borne out by an examination of the fracture which shows practically a complete lack of crystalline structure and also discoloration. The remedy of course is to apply a different method of gating. Separate the patterns and use a longer flask which will permit location of the gate so that the metal has the shortest distance to flow. If you want to use the same flask and pattern arrangement, the sprues may be placed in the center of the rectangles formed by the fittings with four runners leading into each corner. While those gates may be a little more difficult to remove, they will provide the shortest flow to each valve and insure adequate metal to each valve.

A pouring temperature of 2350 degrees is too high for the work. This is indicated clearly by the trouble from leakers. Too high a pouring temperature results in slow cooling with attendant coarse and open crystal structure and porous metal. Pour at the lowest possible temperature at which the mold cavity will be completely filled and result in sound castings. We note that you mention the use of phosphor-copper for deoxidation. Your present alloy contains nearly 12 per cent zinc, and that is more than enough by a considerable degree to take care of any slight oxidation that might occur during melting. Try pouring some castings without the addition of phosphor-copper, and see whether you can distinguish any difference between those and others in which phosphor copper is employed.

Weight Required To Hold Cope Based on Surface Area

How much weight should be placed on molds holding red and yellow brass castings to prevent the mold from straining? Flasks are 12 x 16 and 10 x 21 inches. Castings weigh 6, 8 and 10 pounds. Sand is No. 00 and No. 1 Albany. Metal temperature is 2300 to 2350 degrees Fahr.

Two causes are responsible for metal straining in molds. In one the amount of weight on the cope is a factor. In the other the amount of weight on the cope is not a factor in the problem. In the first case the mold is rammed properly to resist the weight and the ferrostatic pressure of the metal. If the weight on the cope is not sufficient the pressure will force the cope upward. Some metal will run out at the joint and the casting thickness will be increased.

In the second case the sand in the mold is not rammed sufficiently hard. Even though the weight on the cope prevents the cope from rising, the soft sand permits the casting to strain beyond normal size in the mold. Another point frequently overlooked is that the weight on the cope bears no relationship to the weight of the casting in the mold. The weight required to hold the cope in place is based on the surface area of the casting in contact with the cope, and the height of the sprue. Thus the weight required to hold the cope on a casting 1-foot square and ½-inch thick is exactly the same as the weight required to hold the cope on a casting with the same cope surface area and 6, 8, 10 inches or any other thickness.

The problem simply is the amount of liquid pressure under a given head. Static pressure on the cope is found by multiplying the area of the casting in square inches at the joint of the mold by the height in inches from the gate to the top of the sprue or pouring basin, and by the constant 0.26-pound. For example if the area of the casting is 8 x 10 inches and the height of the sprue is 4 inches, the static pressure is 8 x 10 x 4 x 0.26, or 83.20 pounds.

Metal Backing Out of Sprues Shows Gassing Has Occurred

On our phosphor bronze bushings ranging in weight from 10 to 50 pounds the metal backs up in the sprues and the castings are spongy. We melt two compositions. One contains copper 90 per cent, tin 10 per cent, phosphor copper 0.25 per cent. The second mixture contains copper 88 per cent, tin 10 per cent, zinc 2 per cent.

Metal rising in the sprue instead of sinking quietly after pouring ceases may be due to one or a combination of causes, but the most probable cause is the melting condition in the furnace. Molten metal, particularly metal high in copper content, readily absorbs gas. Where the furnace operates on a reducing condition, that is where complete combustion does not take place, a certain amount of carbon remains unconsumed in the form of carbon monoxide and that gas is absorbed by the metal. When the metal solidifies, the shrinkage and compression drives some of it out with consequent rise of metal in the sprue and riser. In a reasonably rigid mold this is the only direction in which the metal can flow.

The remainder of the gas remains in the casting and during the machining operation is revealed in the form of cavities which may be small or large. Irrespective of the type of furnace or fuel employed, the fuel must be burned in a manner to insure complete combustion. That is, an oxidizing condition must prevail instead of a reducing condition. The ideal condition is neutral, but that is almost impossible to maintain. Briefly and in ordinary shop language the metal must be melted fast and hot. If your furnace is a slow melter, adopt some method for speeding up the process. On a coke fired crucible pit furnace, increase the height of the stack, or the opening, or apply a blower under the grate. Illuminating references to melting practice and the causes of gassed metal have appeared from time to time in THE FOUNDRY in the series of articles on brass foundry practice by N. K. B. Patch. Your attention particularly is directed to the issues of Nov., 1937, Sept., 1938, Nov., 1939, Feb., and June, 1940.

Higher Temperature Is Required

We have had a lot of trouble making castings of an alloy containing 15 per cent silver. The castings are approximately 6 x 12 inches, tapering from ⅝ to ⅛-inch in thickness. We skin dry the molds. Our main trouble seems to consist of lines or layers which go all the way through the castings like cold shuts.

You mention that the alloy contains 15 per cent silver, and we wonder if that is not a slip of the pen, and that you refer to a nickel-silver containing 15 per cent nickel. Since you give little information, it is difficult to decide definitely the cause of the trouble since it might be too low a pouring temperature, improper gating, lack of vent, etc. Any of those may result in a cold shut which seems to be your difficulty. One of the first things to consider should be the pouring temperature, and we believe that if it is around 2400 to 2450 degrees Fahr., it should be satisfactory, and possibly at the higher limit since the work is thin.

We believe that the best method of gating the casting will be to use a runner extending along the side with the longest dimension, with a number of gates leading into the thickest side of the casting. The runner should be heavy and oval in shape rather than square or rectangular—say 1¼ inches at the wider diameter and 1-inch at the narrower. It should be placed about 1¼ inches from the casting. The sprue should be around 1½ inches in diameter, and seven gates are suggested. The gates at either end of the casting can be 1¼ inches wide while those in between can be 1-inch wide, leaving the spacing between gates ¾-inch. The gates of course, are tapered from the runner diameter 1-inch to the thickness of the casting or perhaps just a trifle thinner to indicate where they should be cut off. On the side opposite the gates and on both ends use numerous scratch vents.

Use Pouring Cup on Steel Castings

In a recent issue of THE FOUNDRY we noted an illustration showing two men pouring a floor of small steel castings. The pouring heads or cups appeared to be some form of refractory bushings independent of the copes. We shall appreciate information on the composition of this material and where it can be obtained.

The pouring cups to which you refer and which are employed extensively, particularly in green sand steel foundry practice, are not made from any particular or proprietary refractory compound. A black core sand mixture is employed and the cups are made and dried in the manner usually employed in handling small cores. For example one typical mixture contains 1000 pounds old sand, ½-pound cereal binder, 7 pounds pitch binder and 1 quart molasses. A double corebox is mounted on a hand power jolt rollover machine and the usual output for an operator is approximately 700 cups per day. Local conditions vary to some extent in different sections of the country, but a general and rough approximation shows that the cost of each cup is one cent. The cup is used only once. Usually it cracks by itself. Whether it does or not it is broken from the head in the shaking out process.

Wide Bronze Tablet Is Overweight

We have trouble with cutting and scabbing on the face of a bronze tablet 44 x 49 inches, 5/16-inch thick with a 3-inch border all around. The cleaned casting weighs 445 pounds and with gates and risers 550 pounds. We have tried several combinations of facing sand, with and without sea coal.

The first impression one gets on reading this inquiry is that there is something wrong either with the weight or with the dimensions. While this feature has no direct bearing on the cutting and scabbing, it is an important feature in the production of a perfect casting and is worthy of passing comment. The plate is approximately 4 feet square. A plate of that size 1-inch thick weighs approximately 600 pounds. Therefore a plate 5/16-inch thick should weigh only about 200 pounds Figuring more closely and allowing for the 3-inch border your plate is 50 x 55 inches. Estimated weight is 240 pounds.

Apparently your casting is badly strained. This inevitably happens where the molder is not familiar with this type of casting and where he does not take the proper precautions. The job really should be attempted only if a stiff steel or cast iron flask is available. In this particular instance the pressure against the cope under a 12-inch head is 7200 pounds. Obviously in addition to the usual clamps at the sides and ends of the flask, weights, strongbacks or rails must be placed over the center.

Tablet molding is a specialized branch of the art. Detailed description would require more space than we have at our disposal. The subject has been covered extensively in THE FOUNDRY on many occasions, for example in the issues for September and October, 1934, part of a series dealing with the use of plaster patterns in the foundry. The following brief reference may be sufficient in the present instance. This is a general description subject to modification in minor features for various sizes and types of tablets. Standing on a temporary scaffold 6 to 8 feet high the molder sifts fine facing sand over the face of the pattern. The facing sand contains cereal or pitch binder in the proportion of 1 part to 25 to 30 parts sand. The drag flask then is filled with ordinary molding sand, tramped off and butted. The sand is butted harder than usual outside the edges of the pattern.

Superfluous sand is scraped off with a straight edge, ½-inch of loose sand is spread over the surface and the bottom board is rubbed down to a bearing. The board is removed temporarily and the sand is scored in a criss-cross pattern with the edge of the straight edge. The entire surface then is vented with a wire and the board is returned to place. Wedges are inserted between board and drag before the assembly is clamped and rolled over. The flask must be braced properly with tie rods to prevent a spread during the roll over. After the cope is lifted off and the pattern removed, the face of the mold is sprayed with thin molasses water and then skin dried with a torch or charcoal fire. Preferably the mold should be poured from the top through a multiplicity of small wedge gates, but many tablets are poured from the sides. A central sprue delivers metal to a long runner in the joint extending the full length of the mold and the metal enters through a great number of small, thin, flat gates. Scabbing and cutting are caused by sand too low in permeability, by dampness or by hard ramming. These hazards are prevented by proper venting and skin drying.

Matches Made from Many Materials

Kindly give us a mixture for a hard match that will stand up satisfactorily for sharp parting.

If the inquiry refers to a hard sand match it may be pertinent to point out that care in making, finishing and reinforcing a sand match generally is more important than the material from which it is made. Practically any kind of sand will serve from new molding sand to dust from the tumbling barrels or sandblast. Preference leans to the latter. It is practically fine, takes a good impression and becomes quite hard. The thoroughly dried sand, of any grade, is mixed with

(*Concluded on page* 52)

...use

NICKEL

CAST IRON

Confronted by an intricate casting job which must pass rigid Government specifications, a foundryman's best friend is Nickel. This 10,700 pound casting, part of a fluid clutch drive built by THE HYDRAULIC COUPLER DIV. OF AMERICAN BLOWER CORP. for new American ships, was cast from Nickel alloyed iron by the HILL ACME CO., Cleveland.

How Hill Acme Produced this Big Casting

Entire casting made in the drag. Core arranged so no chaplets were needed. Nickel cast iron assured perfect forming and pressure-tightness of dense-grained structure.

Stress-relief-annealed by holding at 800° F. for slightly more than an hour per inch of section, followed by slow cooling in furnace.

Nickel additions to cast irons promote uniform structures and prevent embrittlement. Freedom from chilled edges and hard spots increases machinability.

Practical information on profitable production of pressure-tight and high-grade ferrous and non-ferrous castings is yours upon request. Please address:

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

(*Concluded from page* 50)
sufficient linseed, or other core oil, to the consistency of ordinary molding sand. For the ordinary size matchplate a handful of litharge is added to the mixture.

The sand is rammed hard, particularly in corners, edges and pockets. Blocks of wood, nails, screws or other pieces of stiff reinforcement are bedded in the sand at strategic points to increase wearability. Fire clay matchboards are preferred by many malleable foundrymen. A detailed description of their manufacture and use appeared in the June 1933 issue of THE FOUNDRY. Under certain conditions, plaster of paris is a satisfactory material for match boards. Several proprietary compounds also are on the market. They produce more satisfactory results than sand matches, particularly where the service is severe as in continuous production work. Manufacturers names and addresses are listed in the advertising pages of THE FOUNDRY.

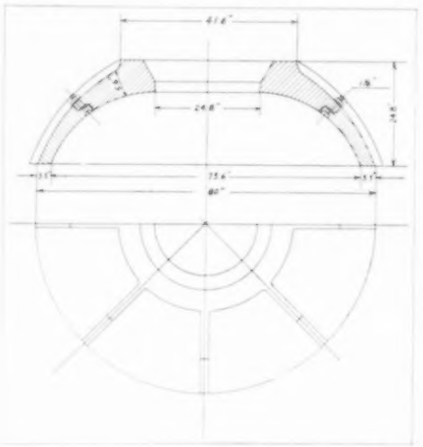
Mold Large Casting In Floor Pit

We operate a foundry in Greece, and have received orders for castings shown in the enclosed sketch for gun and observation post emplacements. We will appreciate information on suitable molding process, molding sand, and analysis of cupola alloy iron which will give the maximum strength.

The most logical procedure for molding the emplacement casting you describe is in a pit in the floor with the heaviest section at the bottom. The large mound of sand forming the interior would be hung from a flat cope using a suitable arbor or crab bolted thereto. At this point a question arises on why the casting is made in two pieces which are bolted together. We assume of course, that your plan sketch is the conventional representation for a symmetrical object. In our opinion the casting can be made in one piece just as easily, and eliminate all machining at the joints.

Sand for the mold should be as open as possible to carry off the large volume of steam and gases which will be generated when pouring this heavy casting, and it goes without saying that ample provision should be made for suitable venting. The casting may be poured through gates at the top edge or at the bottom from gates branching from a central sprue. Method selected will depend on whether one or two ladles will have to be used, and ladle handling equipment available. Large pouring basins should be built on the cope to feed the sprues.

Since the castings must be strong and tough, it is suggested that you try the following compositions: Silicon, 1.60 to 1.70 per cent; manganese, 0.55 to 0.70 per cent; nickel, 1.40 to 1.70 per cent; molybdenum, 0.40 to 0.60 per cent, and chromium, 0.30 to 0.40 per cent—silicon, 2.00



Sketch of heavy casting used for observation posts and gun emplacements

to 2.10 per cent; manganese, 0.70 to 0.90 per cent; nickel, 0.80 to 1.00 per cent; molybdenum, 1.00 to 1.20 per cent, and chromium, 0.10 to 0.20 per cent.

Increase Output on Sheave Wheels

We have a large number of sheaves to make ranging in diameter from 3 to 24 inches. We have made them in three-part flasks and also in two part flasks with a dry sand ring core. The day's work for a man on the 14-inch size is 10 all green sand, and 15 with the dry sand core. We do not feel that the increase has warranted the additional expense of prints, coreboxes, coremaker's time and materials.

For want of definite information on present equipment and shop conditions, or volume of castings on order we do not feel free to comment on a man's daily output except to say that 15 plain sheaves with dry sand cores forming the grooves in the rims does not sound impressive. With a jolt squeeze molding machine, good pattern plate and a 16-inch snap flask, a man shoveling his own sand should turn out approximately 90 molds per day. Practically all sheaves over 6 inches diameter are made in this manner.

Under 6 inches the lower half of each sheave ring is loose. Usually four patterns are mounted on a plate and a three part flask is employed. Cope is rammed first and rolled over. Cheek and drag are rammed and then the drag is lifted and the loose rings are removed. The drag is returned to place and the entire assembly is rolled over. The cope is lifted and the pattern plate is removed. Then the cope is replaced. Several years ago two articles in THE FOUNDRY described 10 different methods of molding sheave wheels. These articles now form chapters 33 and 34 in a book *Tales From the Gangway*, published by the Penton Publishing Co., Cleveland.

Leakage Is Caused By Poor Feeding

We are sending a valve body and a piston which we are making. These castings must withstand an air pressure of 150 pounds per square inch and they should be lubricated at all times. However, our customer has experienced many cases where they have run dry. Formerly the castings were made in the 85-5-5-5 alloy, but now the customer desires the castings to be made in the 80-10-10 alloy. Our problem is in the piston. Since the customer has requested the 80-10-10 alloy, we cannot get the piston to withstand the air pressure and have experienced considerable losses due to leakage. Can you suggest the kind of metals to use in both valve body and the piston? It is our present knowledge that the two metals should be different to eliminate galling and seizing.

While your customer evidently has some reason for requesting the use of the 80-10-10 alloy for the valve body and piston, we cannot figure out quite what it is since that particular alloy essentially is a bearing alloy. Possibly your customer has the idea that the bearing alloy will operate more satisfactorily under nonlubricated conditions, but unfortunately, that will not be the case.

We believe that it will be much better to make the castings in an alloy designed for pressure work. The 85-5-5-5 should be satisfactory for the pressure involved. Other alloys that will serve with excellent results include one containing 84 per cent copper, 3 per cent tin, 5 per cent lead, 7 per cent zinc and 1 per cent nickel. Another contains 88 per cent copper, 8 per cent tin, and 4 per cent zinc. A third which is known as steam or valve bronze contains 86.5 per cent copper, 5.5 to 6.5 per cent tin, 1.5 to 2.0 per cent lead, 2.0 to 5.0 zinc, and 1 per cent maximum nickel.

Your present difficulty with the pistons we believe is not due to the particular metal involved, but essentially is due to the method of molding. The piston has very heavy sections adjoining others that are very thin, and at the junction of the two, a draw or pulling away has occurred. Examination of that section with a low power magnifying glass shows the fine cracks. It is our opinion that the trouble essentially is due to lack of feed into the heavy sections.

Speed up PRODUCTION WITH TRULINE BINDER

REG. U. S. PAT. OFF.

Get more cores and more sound, clean castings

WITH THIS LOW-COST BINDER

Truline Binder comes to you as a uniformly pulverized powder, in clean convenient-sized paper bags, easy to handle. It mixes readily with green, dry, or reclaimed sand. The core-sand mix has low green strength, rams quickly, allows you to turn out *more cores per hour*.

Interested? Read on . . .

● Truline Binder bakes quickly to a strong bond, because it fuses and hardens and does not require air to develop bond. You get good cores, with excellent dry strength, that stand up to the action of hot metal with minimum cutting and washing. And, incidentally, you can often use high proportions of reclaimed sand. The real meat here is that *baking times are sharply cut.*

That's not all . . .

● Truline Binder loses its bond, sharply, above 650°F. Thus, cores collapse and disintegrate as the heat of the casting gets into them. The result is easy knockout and a big reduction in cleaning time. Thus, you can *move much faster on the cleaning floor.*

● The final touch of speed is gained because, with Truline-bonded cores that collapse in time, your castings can shrink freely. Rejects due to shrinkage-cracks are held to a minimum, *further increasing your production.*

Truline Binder is doing these things for others right now.

Any or all of these benefits may be realizable in your own foundry operations. If you're interested in more good cores and castings per man-hour from your present equipment, write for full information and a trial amount. Or better still, ask us to demonstrate Truline Binder—the new-type bonding agent—right in your own plant.

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MEN of INDUSTRY

A. S. KLOPF recently appointed vice president and manager of the foundry division, Hansell-Elcock Co., Chicago, received a degree of mechanical engineering from Marquette university and the degree of master of science in metallurgical engineering from the University of Wisconsin. He then joined the engineering department of the Worthington Pump & Machinery Corp., Cudahy, Wis., and later became connected with the Allis-Chalmers Mfg. Co., Milwaukee, in the engineering department and plant construction. He completed the co-operative student apprentice course at the Allis-Chalmers Mfg. Co. in 1927 and then worked in the mining, crushing and cement machinery engineering department of that organization, later becoming design engineer in that work. He left the industrial field to become instructor in mechanical engineering at Marquette university and in 1934 was appointed assistant professor of mechanical and metallurgical engineering. During the work at Marquette, Mr. Klopf engaged in considerable consulting work with industries in the Milwaukee area in connection with mechanical and metallurgical engineering. In December, 1937 he was made assistant to the president of Ross-Meehan Foundries, Chattanooga, Tenn., and 2 years later was made foundry superintendent, Kearney & Trecker Corp., Milwaukee, remaining their until his recent connection with the Hansell-Elcock Co.

* * *

W. L. BEAUDWAY has been appointed executive vice president, Chicago Malleable Castings Co., Chicago, and J. T. LLEWELLYN II, vice president.

* * *

EDWIN W. HORLEBEIN, president, Gibson & Kirk Co., Baltimore, recently was elected chairman of the newly formed Chesapeake chapter of the American Foundrymen's association. Mr. Horlebein was born in Baltimore in 1897 and was educated in the public schools and Polytechnic high school. He then became connected with the Baltimore & Ohio railroad as a machine apprentice and remained there until he entered the field artillery officers training school at Camp Zachary Taylor, Ky., where he was commissioned as a lieutenant in 1918. Following the war he was connected with the engineering department of the Dixie Mfg. Co., Baltimore, and in 1924 joined the Gibson & Kirk Co. He is a member of the A. F. A., A. I. M. E., A. S. M. E., A. S. M., A. S. T. M., the Institute of Metals, (British), and the National Founders' association.

* * *

HAROLD F. FALK recently was promoted to the position of general superintendent, Falk Corp., Milwaukee. Upon receiving his degree from the school of engineering, University of Wisconsin, Mr. Falk became associated with the Falk Corp. and rose to the position of superintendent of the welding department where he remained until 1936. After devoting his attention to time study and special work in the shop and engineering departments, he was placed in charge of shop production and schedules in 1937, working in that capacity until 1940 when he was appointed production manager.

* * *

ED F. WEINHEIMER recently was made assistant sales manager, Ironton Fire Brick Co., Ironton, O.

* * *

RICHARD M. MARSHALL, formerly vice president and secretary, Woodward Iron & Steel, Birmingham, Ala., has been elected executive vice president, Pittsburgh Coke & Iron Co., Pittsburgh, succeeding the late Albert P. Meyer. Before becoming

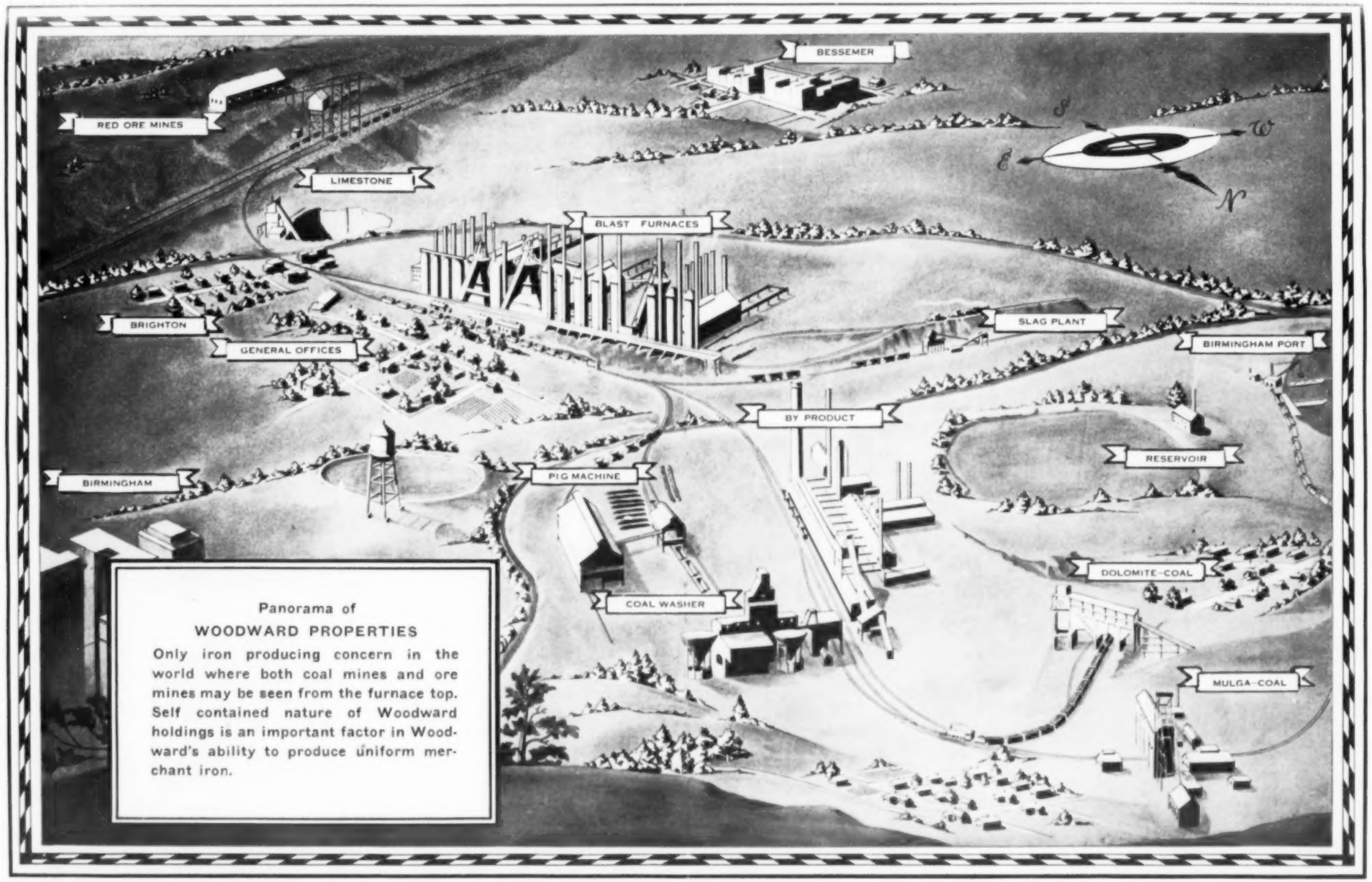
(*Continued on page* 56)

W. L. Beaudway

A. S. Klopf

Harold F. Falk

E. W. Horlebein



WOODWARD IRON COMPANY WOODWARD, ALA.

America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer

(*Continued from page* 54)

associated with the Woodward Co. in 1935, Mr. Marshall was vice president, general manager, Sloss-Sheffield Steel & Iron Co., Birmingham.

♦ ♦ ♦

HERMANN P. GOOD, recently elected president of the Reading Foundrymen's association, Reading, Pa., is foundry manager of the Textile Machine Works, Reading. Mr. Good was born in Hamburg, Pa., and attended Reading public schools, graduating from Reading high school in 1917. From that time to 1932 he was connected with the Atlantic Refining Co., Reading Railroad Co., Luria Bros. & Co. Inc., and H. R. Breneman Co. for varying lengths of time. Mr. Good began with Textile Machine Works in 1932 as production and order clerk, and was advanced to production manager in 1935. Three years later he was appointed foundry superintendent and in 1940 was made foundry manager.

♦ ♦ ♦

GEORGE A. BRYANT, executive vice president and general manager, Austin Co., Cleveland, since 1930, recently was elected president and general manager, succeeding the late W. J. Austin. Mr. Bryant, a native of Chicago, received his engineering education at the University of Illinois, Urbana, Ill., and first became associated with the Austin Co. as field engineer 27 years ago on a building job near Medicine Hat, Alberta, Canada. This started a sequence of jobs which took Mr. Bryant to points throughout the Eastern half of the United States and Canada as field engineer, chief clerk and job superintendent. In 1916 he was made district superintendent in New England and later became manager of the company's office in Philadelphia. At the beginning of the World war in 1917 he was in charge of the company's offices in New York, Philadelphia and Washington, and directed the operations of the company throughout the East. In 1918 he was made general sales manager.

♦ ♦ ♦

LUTHER A. KLEBER, recently made assistant foundry superintendent, commonwealth division of the General Steel Castings Corp., Granite City, Ill., was educated in public and private schools, and through university extension. In November, 1915, he joined the Taylor-Wharton Iron & Steel Co., Easton, Pa., but left immediately after war was declared to enlist in the army, serving 2 years in France. He rejoined the Taylor-Wharton company the latter part of 1919. During the next 9 years he served in various capacities as cleaning room supervisor, assistant foundry superintendent, and superintendent of foundry, pattern shop and cleaning room. In July, 1928, he was transferred to the High Bridge, N. J. plant of that company and for the next 12 years was assistant foundry superintendent, foundry superintendent, and foundry manager. He is a member of the American Foundrymen's association, and was elected a director of the Metropolitan chapter in 1940. He now is active in the work of the St. Louis District chapter and recently delivered a lecture on synthetic molding sands in connection with the lecture course conducted by that chapter.

♦ ♦ ♦

WILLIAM G. MIXER has been appointed foundry superintendent of the Buick Motor division, Flint, Mich., succeeding B. H. Newell who has been elevated to the post of assistant general superintendent of Buick, in connection with the transfer of about 40 executives to a new aircraft engine division. The latter, now in process of organization, will begin production of Pratt & Whitney 1830-cubic inch displacement radial engines, the navy department having appropriated $34,000,000 to finance the new plant. In charge will be D. E. Williams, formerly Buick comptroller. Other department heads of the aircraft division include J. G. Hammond, general manufacturing manager; R. H. Archer, general superintendent; C. N. Ofield, chief inspector; H. E. Hardenbrook, works engineer; Harry Golden, assistant chief engineer; L. A. Stewart, director of purchases.

♦ ♦ ♦

J. EDWARD YOCH, Belleville industrialist, has been named temporary trustee of the Enterprise Foundry Co., Belleville, Ill.

♦ ♦ ♦

GERALD B. DUFF, 68 Clinton avenue, Newark, N. J., has been appointed sales engineer, for the Despatch Oven Co., in the Newark-New York territory.

♦ ♦ ♦

P. J. ESLING, formerly connected with the Albion Malleable Iron Co., Albion, Mich., now is in charge of the cost department of the Detroit Brass & Malleable Works.

♦ ♦ ♦

ROY J. HARRISON, general manager, Harrison Steel Castings Co., Attica, Ind., recently took his seat as a state representative in the Indiana general assembly at Indianapolis.

♦ ♦ ♦

KENNETH HAMBLIN, formerly superintendent of the Thomas Devlin Mfg. Co., and more recently of the Detroit Brass & Malleable Works, now is superintendent of the Albion Malleable Iron Co., Albion, Mich.

♦ ♦ ♦

ROBERT L. LERCH has been appointed general sales manager, Haynes Stellite Co., unit of Union Carbide & Carbon Corp., New York. Mr. Lerch has been associated with the Haynes company since 1924.

♦ ♦ ♦

L. CHAPMAN has been elected president, H. Kramer & Co., Chicago, succeeding the late I. Kaden. Mr. Chapman joined the Kramer company in 1917 as a shipping clerk

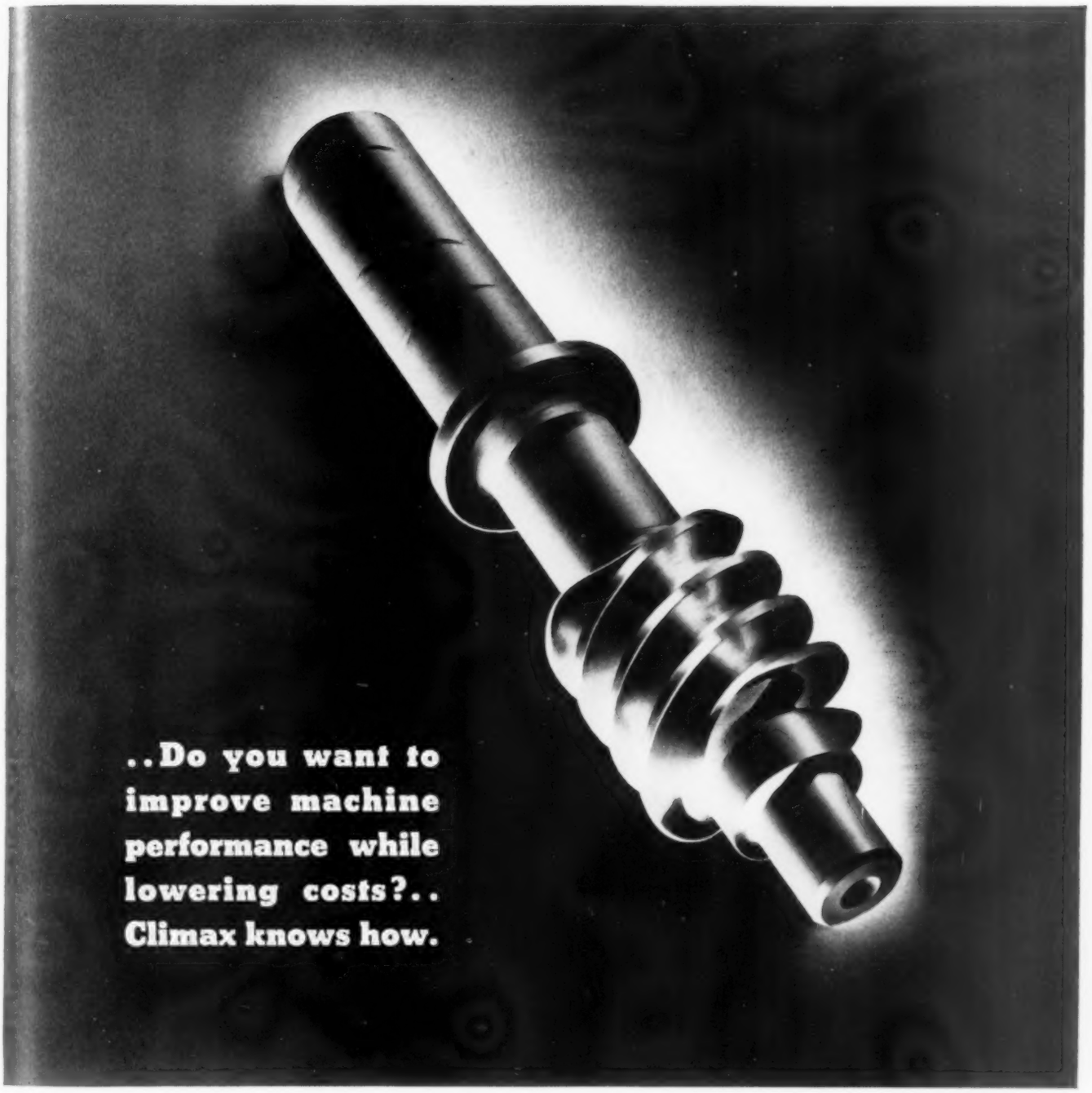
(*Concluded on page* 58)

Hermann P. Good

George A. Bryant

Luther A. Kleber

William G. Mixer



Worm gears for domestic stoker drives call for strength plus wear resistant hardness.

Realizing that neither failures nor noisy gears build good will a forward-looking manufacturer now casts such gears from a Chromium-Molybdenum (0.50% Mo) iron. A 40-50 Rockwell "C" hardness and high strength, after heat treating, meet all requirements and have materially improved performance while reducing costs.

A copy of our technical book, "Molybdenum in Cast Iron" will gladly be sent without charge to interested Production Executives.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE BRIQUETTES FOR THE CUPOLA—FERROMOLYBDENUM FOR THE LADLE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

(*Concluded from page 56*)

and worked through all divisions before entering the sales department in 1920. Three years later he was named vice president in charge of sales. WILLIAM ROMANOFF and S. M. MARKS continue as vice presidents and H. A. SKOLNIK as secretary.

♦ ♦ ♦

DR. EMIL J. HELLUND has joined the technical staff of Battelle Memorial institute, Columbus, O. and has been assigned to the division of applied physics. He is a graduate of the University of Washington, Seattle.

♦ ♦ ♦

HARRY L. ERLICHER, purchasing agent of General Electric Co., Schenectady, N. Y., since 1931, and an employe of the company 40 years, recently was elected a vice president. He will continue to be in charge of the company's purchasing activities.

♦ ♦ ♦

W. D. MURPHY, formerly advertising manager, Sloan Valve Co., Chicago, and vice president, National Industrial Advertisers association, has joined Reincke-Ellis-Younggreen & Finn Inc., advertising agency, Chicago, in an executive capacity.

♦ ♦ ♦

J. J. COYNE, for many years manager of the Chicago office of the Sterling Wheelbarrow Co., Milwaukee, retired Jan. 1. F. L. Coyne, recently manager of the Cleveland office, has been appointed manager at Chicago, and L. T. Crosby has been made manager of the Cleveland office.

♦ ♦ ♦

ALFRED W. THOMPSON recently has been elected president, Ludlow Valve Mfg. Co., Troy, N. Y. Mr. Thompson formerly vice president and general manager, succeeds LIVINGSTON W. HOUSTON who has been named chairman of the board. HARRY HOFFMAN, New York, was elected vice president.

♦ ♦ ♦

B. B. WILLIAMS, for the past 20 years president, Cooper-Bessemer Corp., Grove City, Pa., has been made chairman of the board succeeding DR. E. J. FITHIAN. C. B. JAHNKE, vice president and general manager, has been elected president, general manager and a member of the executive committee.

♦ ♦ ♦

J. K. BYBEE, formerly of the Indianapolis office, Ampco Metal Inc., Milwaukee, recently has been placed in charge of the Michigan territory with headquarters in Detroit. E. A. SVOBODA, formerly of the Chicago office, has been transferred to Indianapolis. W. B. MCKENZIE, until recently located at Buffalo, has been advanced to Chicago, and A. J. REYNOLDS, previously an engineer at Boston, also has been transferred to the Chicago office. H. R. GORDON now is responsible for Ampco representation throughout the New England states and has headquarters at Springfield, Mass. FRANK P. GEY, who recently has become connected with the Ampco organization, has been assigned to the Pittsburgh territory.

♦ ♦ ♦

R. L. CLELAND JR. has been appointed service engineer in New England for Eastern Clay Products, Inc., Eifort, O. Mr. Cleland's initial foundry experience was with the Lakey Foundry & Machine Co., Muskegon, Mich., in 1928. Later he worked for a time in the laboratory of the Chevrolet gray iron laboratory and was connected for several years with the Allegheny-Ludlum Steel Corp., Buffalo. He has done much individual research on clays and molding sands.

Loads Foundry Waste into Wagon

DIESEL tractor and loader used to load broken cores, molding sand and other foundry waste into wagons for hauling the materials to the dump. Illustration courtesy Caterpillar Tractor Co., Peoria, Ill.

Steel Founders Plan Annual Meeting

Annual meeting of the Steel Founders' Society of America will be held at the Edgewater Beach hotel, Chicago, Feb. 12 and 13. A portion of the program will be devoted to business and committee reports.

As a special feature of the meeting, Maj. Gen. D. M. Pratt of the British Tank Corps will describe his experiences in connection with the evacuation at Dunkirk. Lt. Col. Christmas of the United States war department also will appear on the program.

A technical session will feature, as part of the program, a paper, "Use of Internal and External Chills," by C. E. Westover, Burnside Steel Foundry Co., Chicago.

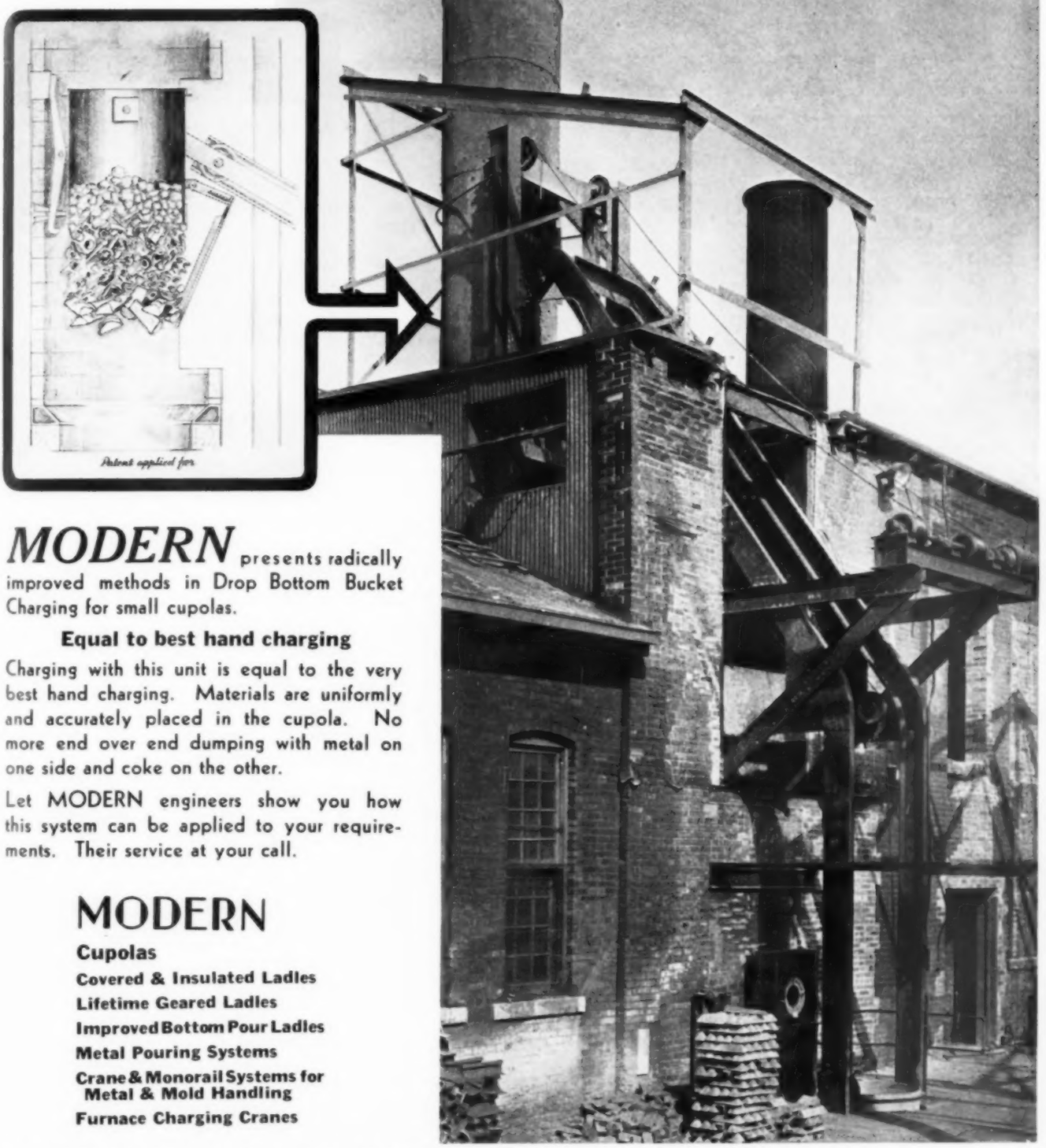
Employe Training

A new report, "Intensive Training of Industrial Employes" recently has been issued by the Policyholders Service bureau, Metropolitan Life Insurance Co., 1 Madison avenue, New York. This indicates some of the initial steps to be taken in meeting the problem of training employes which include accurate determination of a company's labor requirements, careful analysis of the employe's qualifications coupled with proper placement, and better organization of labor sources.

Publishes Papers

Porcelain Enamel institute, Chicago, has made available in book form all the papers presented at its annual institute held at the University of Illinois, Urbana, Ill., in October 1940. The book contains 25 papers relating to various phases of the enameling industry, and copies may be secured for $2 from the Porcelain Enamel institute, 612 North Michigan avenue, Chicago.

Speed up your Cupolas for Defense!



MODERN presents radically improved methods in Drop Bottom Bucket Charging for small cupolas.

Equal to best hand charging

Charging with this unit is equal to the very best hand charging. Materials are uniformly and accurately placed in the cupola. No more end over end dumping with metal on one side and coke on the other.

Let MODERN engineers show you how this system can be applied to your requirements. Their service at your call.

MODERN

Cupolas
Covered & Insulated Ladles
Lifetime Geared Ladles
Improved Bottom Pour Ladles
Metal Pouring Systems
Crane & Monorail Systems for Metal & Mold Handling
Furnace Charging Cranes

MODERN EQUIPMENT COMPANY

PORT WASHINGTON, WIS., DEPT. 175

Modern Charger at Pohlman Foundry Co., Buffalo, N. Y.

MODERN EQUIPMENT CO.

THE ADVENTURES OF BILL

By PAT DWYER

Drawings By RICHEY

HOW would you like," said Bill the other night, "to collect a pot of money with practically no effort?"

"What's the use of talking piffle?," I said. "The thing simply can't be done."

"I read an article the other night in which the author showed not one but a dozen ways. I forget his name and most of the schemes, but the whole thing gave me an idea."

"I'll listen, but I think it is only fair to warn you in advance that any interest I may show is based on common politeness and is merely coincidental. Shoot if you must this old gray head, but for the lovamike, cut it short, he said."

"Thank you kindly sir for them thar heartfelt words of appreciation. They warm my heart. They steel my sword and—er—all that kind of stuff."

"It's a pity the cat did not steal your tongue when you were but a prattling babe. Carry on."

"That is what I like, the good old stick to the finish, do or die, shoulder to shoulder spirit. This here now writer fella presented the case history of about a dozen people down and out who had hit on plans for making right sizable gobs of the old mazuma. Why can't you and I get together on a job of that kind and lay away a barrel or two of nice, clean government promises to pay, preferably in bills of large denomination?"

"The anticipated result presents some certain mild attraction, but I have a melancholy foreboding that the eggs in your hatching clutch are addled. Better stick to the foundry where you know your way around."

"That's where I got ya. I am going to stick to the foundry. We shall collect all the yarns, legends, stories and traditions of the foundry, weave 'em into a book and there y'are."

"Who does the weaving?"

"What a silly question. You do. In addition to the stock of stories already on tap as you might say, I can collect others from fellows I know here and there. I had two the other day from my old friend John Bull. He now is domiciled in Canada, but he served his time and worked for many years in England.

"John deposes and says that on a day off in Sheffield he and a few cronies were engaged in the noble occupation of tossing off a few pots in a pub. The talk of course was confined to the finer technical and practical details involved in the production of large castings. One lad bitterly critized the manner adopted for molding and casting large marine cylinders at the foundry where he worked. He had protested to the boss on several occasions, showed him how the job should be done, but the stubborn old plug paid no attention. Our hero knelt on the sanded floor and drew a series of diagrams illustrating his pet theory. While he was engaged in setting and anchoring the port cores, one lad quietly slipped out. In a nearby foundry he borrowed a hand ladle of iron and brought it in just as the first lad was showing the proper position for the runner and risers.

"'Walter,' says the iron carrier, 'to my certain knowledge you been on that job now for 10 years come Boxin' day. Time it was cast before it turns sour.' He spilled the ladle of iron in what was supposed to be the runner basin and of course the iron ran in a blazing sheet all over the wood floor. The startled molder jumped to his feet. The remainder of the gang looked on in high approval. The landlord came bounding from behind the bar like one of them there lions in the old Roman arena when he spotted a sizable Christian martyr. He tripped over the shank of the hand ladle which the pourer thoughtfully had left in his way for that very purpose.

Tourist hits gaffer for job

"He almost skidded into the iron, but recovered in time to get on his feet and curse them all heartily for a bunch of ignorant, half drunken blinkin' pyromaniacs. He confidently predicted that in a future existence they and their probably anonymous parents would have a chance to find out something about a real fire—from the inside. The lads laughed in amused toleration. Accustomed for years to fire, smoke, flames and molten metal, they told the landlord to stop screeching. Such language if heard by neighbors and passers-by would give the place a bad name. With the shovel, tongs and poker from the open fireplace they carried the piece of iron out in the yard. The blazing floor was extinguished when one lad picked up the beer pots one after another and spilled the contents on the fire."

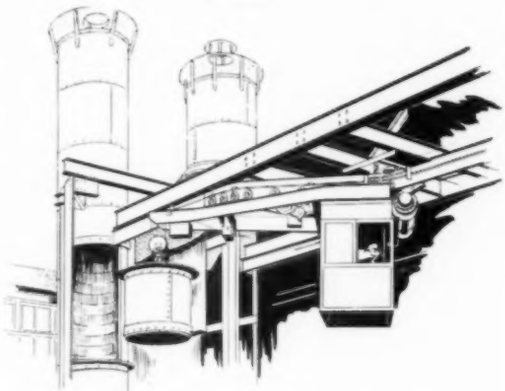
"The old Gulliver technique," I said. "Expurgated edition."

"I don't know," said Bill, "if Gull was there or not, but anyway they expurgated the fire. John was not so fortunate another time when he almost got a job with a foundryman who made his own patterns. Very ingenious lad with original ideas. You never would guess how he solved his own problems. Here's John's plain, unvarnished account of this remarkable performance."

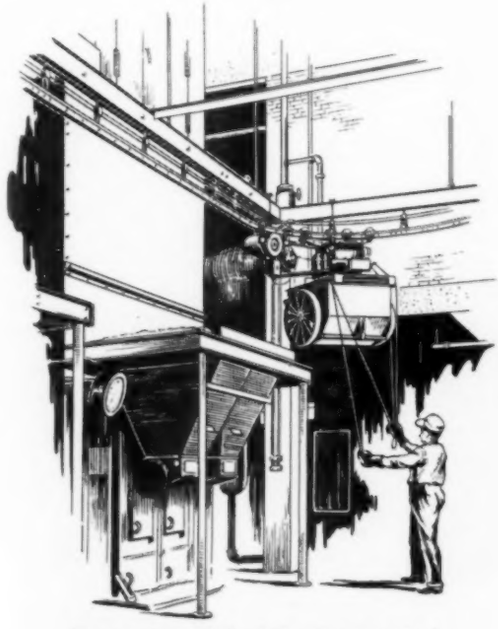
On one occasion many years ago when I was a young journeyman molder in England I was doing a bit of road work in search of a job. I don't know if the American custom of hopping freight trains still is in vogue, or if it has been adopted in England with all the other customs and habits introduced by the cinema including slang and idiomatic ex-

(Continued on page 62)

Hand operated system for safe and fast pouring.



Mechanical charger permits uniform distribution of materials.



Power operated bucket reduces cost of handling coal.

Save your Man-Power!

Skilled labor is expensive. Why waste it in handling operations. A simple overhead monorail system to perform the "lift" and "Carry" jobs will show an immediate return in saved man-power.

Standard parts assemble into complete systems to meet special requirements so that American MonoRail engineers are able to solve many problems without excessive cost. Let them survey your requirements at no obligation.

Write for copy of "Blue Book" showing hundreds of installations

AMERICAN MONORAIL

13104 Athens Avenue
CLEVELAND, OHIO

(*Continued from page* 60)

pressions. However, in my day a molder or any other mechanic out of work for any reason packed all his worldly goods in a colored handkerchief, hung it on a stout stick over his shoulder and tramped the high road from one place to another. Economic necessity was at the base of some journeys, but in many instances the spirit of adventure, the lure of the open road, which I have noted is not confined to any nationality or to any country, was the only incentive needed to make a man quit one job and go looking for another.

Needless to say the practice was enjoyed more by young unattached men than it was by older, settled men with family cares and responsibilities. The situation is summed up nicely in a popular song of the day written about 150 years ago and which by the way popped up again in Kenneth Robert's recent magnificent novel *Rabble in Arms* dealing with certain episodes in the war of 1812 between Great Britain and the United States. He quotes the entire composition, but the first verse will give the general idea: "These were the happy, golden years when I was in my prime. The lasses took delight in me, I was so neat and fine. I roamed about from fair to fair, likewise from town to town. And then I married me a wife—and the world turned upside down!"

"Kindly pardon me for interrupting," I said, "but what has all this to do with making patterns?"

"Keep your hair on. You should know by this time that the sturdy, solid, highly competent and this-rock-shall-fly-as-soon-as-I British mechanic cannot be hurried. We'll come to the patterns presently. Le's see, where was I? Ah, yes. The touching little verse, highly approved by all men and indignantly condemned by all women. Singularly enough the two emotions approval and disapproval spring from vanity, probably the most delicate and sensitive nerve in either the male or female bunch of contradictions."

"A little more of the pattern stuff, my good man. 'Tis true my time is of little value, but dash it all a man must draw the line some place. Kindly consider the line drawn at dissertation on a subject with which every person is familiar. Vanity has been the curse of the human race since Eve, decked out in a new, shiny fig leaf persuaded Adam that taking a bite out of the apple would render him independent, invincible, invulnerable, intelligent, interesting, intrepid and—"

"And in the dog house. Who is holding up the procession now? Here I attempt to read a brief and well written communication from a valued friend and what kind of reception or co-operation do I get? Why, none at all, says you and you can lay to that. If there is one thing irritates me more than another it is to have people poking, and prying and gabbing while I am talking. I trust I make my meaning clear. And"—glaring in well feigned ferocity over the tops of his glasses—"I trust I shall not have to speak on this subject again. Are you ready?"

Deep and dignified silence on the part of the party of the second part.

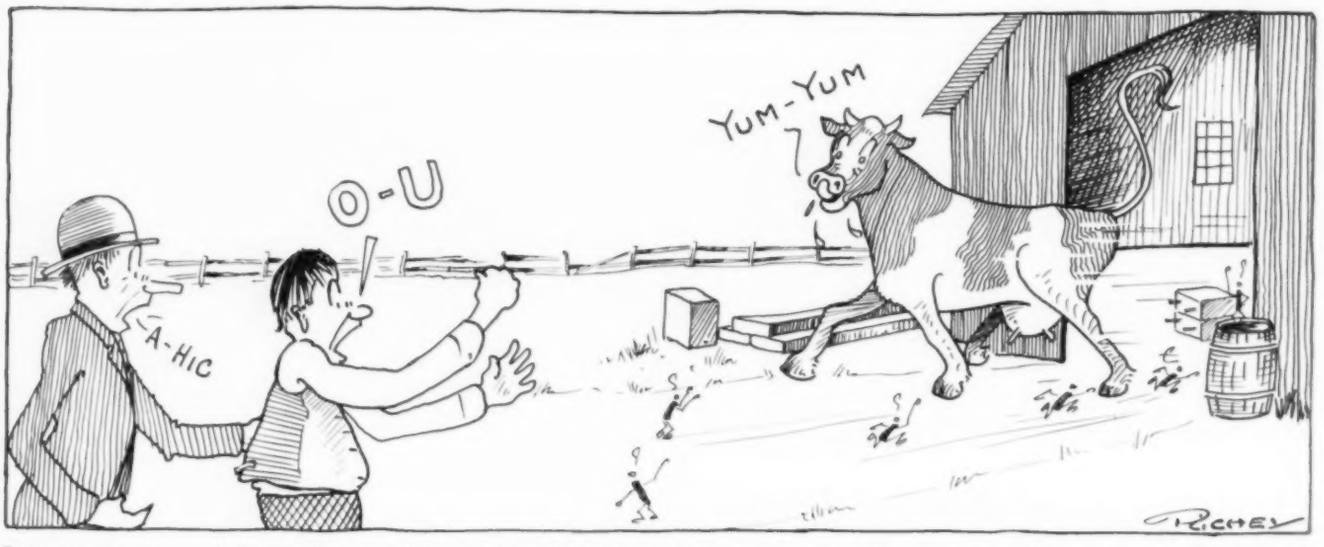
"Deeply appreciative of this hearty and enthusiastic response we shall take up—if I can find the place—the interrupted thread of our discourse. This is a direct quotation from the lad tramping along the road:"

I stopped at a little village where I found a small blacksmith shop with a shed attached fitted up as a foundry with a tiny cupola, a quantity of black sand, a few boxes—flasks to you—and other odds and ends usually employed in the production of castings. Only one man was present. He was sitting on a wood block, busily engaged in carving a large yellow turnip. To my civil request if he had any use for a molder, he replied that he would have as soon as he finished the pattern. At one time or another I have seen patterns of wood, metal, plaster and old castings, solid patterns, shell patterns, matchplates, skeletons and sweeps, but that was the first—and I may say the last—time I ever saw a man carving a pattern for a gear wheel out of a yellow turnip. I have thought several times of mentioning the item to Mr. Ripley, but have hesitated because only a man with patternmaking or foundry experience would realize what it meant.

Over a friendly pipe I mentioned that I had walked a long way and thought it would be good idea to snap up a pot of beer at the local pub. The turnip patternmaker and prospective employer admitted that it was a holy and wholesome thought and did me credit. In fact an idea along the same line had been running through his mind for the past half hour. Every day, he said, about this time he laid down the tools and ambled down to the pub for a refresher. 'I shall go with you,' said this honest carver, 'and we shall put away a pot or maybe two pots of the real stuff. Very good in these parts,' he assured me with a touch of local pride.

He laid the pattern on the block and we walked out, leaving the place open and empty. The pub under the title "Kicking Donkey" was a nice cozy little place and the beer was quite up to his description. Maybe I was extra dry and therefore more appreciative than usual, but whatever the reason I never remember drinking a pot of beer with the coolness, the tang and sparkle of the couple of pots I shared with the turnip man in that little inn. Touched the spot if you know what I mean. The swinging sign over the door carried a spirited representation of the kicking donkey in action, head down, front feet on the ground and hind feet in the air at about an angle of 90 degrees. A vicious looking jack highly creditable to the lad—name unknown—who painted the picture. My new friend directed my attention to this noble work of art. He ad-

(*Concluded on page* 122)



Patternmaker in rural district knows all the words. He brings them out on special occasions. This is a special occasion

St. Louis

LARGEST attendance at any entertainment feature in the history of the St. Louis chapter was one of the many features surrounding the annual party and entertainment given Thursday evening, Dec. 12. Over 350 foundrymen and friends gathered round a festive board at the DeSoto hotel. There were abundant refreshments and a fine turkey dinner was served.

Immediately following dinner a number of prizes were distributed under the guidance of M. A. Bell, chairman of the entertainment committee. An excellent variety show followed under the capable direction of a local master of ceremonies. A musical comedy type of entertainment was then presented. It was the unanimous opinion of all present that it was one of the finest entertainments in the history of the chapter and much credit is to be given the entertainment committee chairman and his fine committee.

An interesting and educational talk on "Ladle Additions for Iron and Steel" was the subject discussed by E. K. Smith, Electro Metallurgical Co., Detroit, at the Jan. 9 meeting of the St. Louis District Chapter of the A. F. A. In addition to pointing out the varying results of ladle additions of certain metallic elements to iron and steel Mr. Smith also presented a series of slides illustrating photomicrographs of varying grain structures in those materials.

The meeting was well attended. The business meeting following dinner included the reading of the secretary-treasurer's report and reports of several committees. R. K. Durkan, chairman of the membership committee, directed attention of the members to the current membership drive of A. F. A. and urged full cooperation by everyone. Chairman of the entertainment committee, M. A. Bell, reported on the successful dinner party and entertainment held during December. L. J. Desparois, vice chairman and chairman of the program committee, directed attention to the February meeting which will be "Equipment Night" and will be under the direction of the various equipment and supply men of the chapter. Final committee report given by Carl Morken, reminded all of the foundry practice school sessions which were resumed on Jan. 15.

Chapter chairman. W. Carter Bliss, re-affirmed the invitation given by the St. Louis chapter to the national organization that the 1942 convention be held in St. Louis. Further announcement was made of intentions to prepare a March extension meeting in Kansas City to be worked out in collaboration with A. O. Nilles, Griffin Wheel Co., Kansas City.—*J. W. Kelin, secretary-treasurer.*

Birmingham

REGULAR meeting of the Birmingham Chapter of the A. F. A. was held Nov. 15 at the Tutwiler hotel, with chairman W. O. McMahon, Sloss-Sheffield Steel & Iron Co., Birmingham, presiding. S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago, delivered an interesting talk, accompanied by lantern slides, on "Automatic Cupola Control by Means of Controlled Combustion, and the Effect of Melting on the Ultimate Behavior of the Iron."

Mr. Massari explained the behavior of the cupola melt by various carbon dioxide contents. With a high carbon dioxide content, the manganese and silicon losses are high and a low carbon dioxide content the losses are very low. For best efficiency, he states, a 13 per cent car-

A great amount of interest has been shown in the foundry practice school staged by the St. Louis District Chapter of the A.F.A. The photographic reproduction above was taken at a recent session at which N. L. Peukert, Carondelet Foundry Co., St. Louis, was the speaker. Photograph courtesy of R. Jacoby, Key Co., East St. Louis, Ill.

bon dioxide should be maintained. He mentioned the fact that it is always well to remember that carbon monoxide is a carburizing gas and carbon dioxide is a decarburizing gas. He showed, by slides, that the obviation of carbon growth and dispersion increase with a drop in temperature. Many questions regarding the topic were asked at the close of the talk.—*J. B. Hayes, chairman of publicity.*

Western N.Y.

ON JAN. 3, the Western New York chapter of the A. F. A. staged its annual stag party at the Trap and Field club, Buffalo. In keeping with the times it was called a conscription party and the members and guests were outfitted to belong to either the army or the navy.

All formalities were dispensed with, Chairman McCallum turning the meeting over to the master of ceremonies at the start and the entire evening was devoted to food and fun. In addition to two bang-up floor shows, attractive prizes were distributed by drawing during the course of the evening and good fellowship reigned supreme.

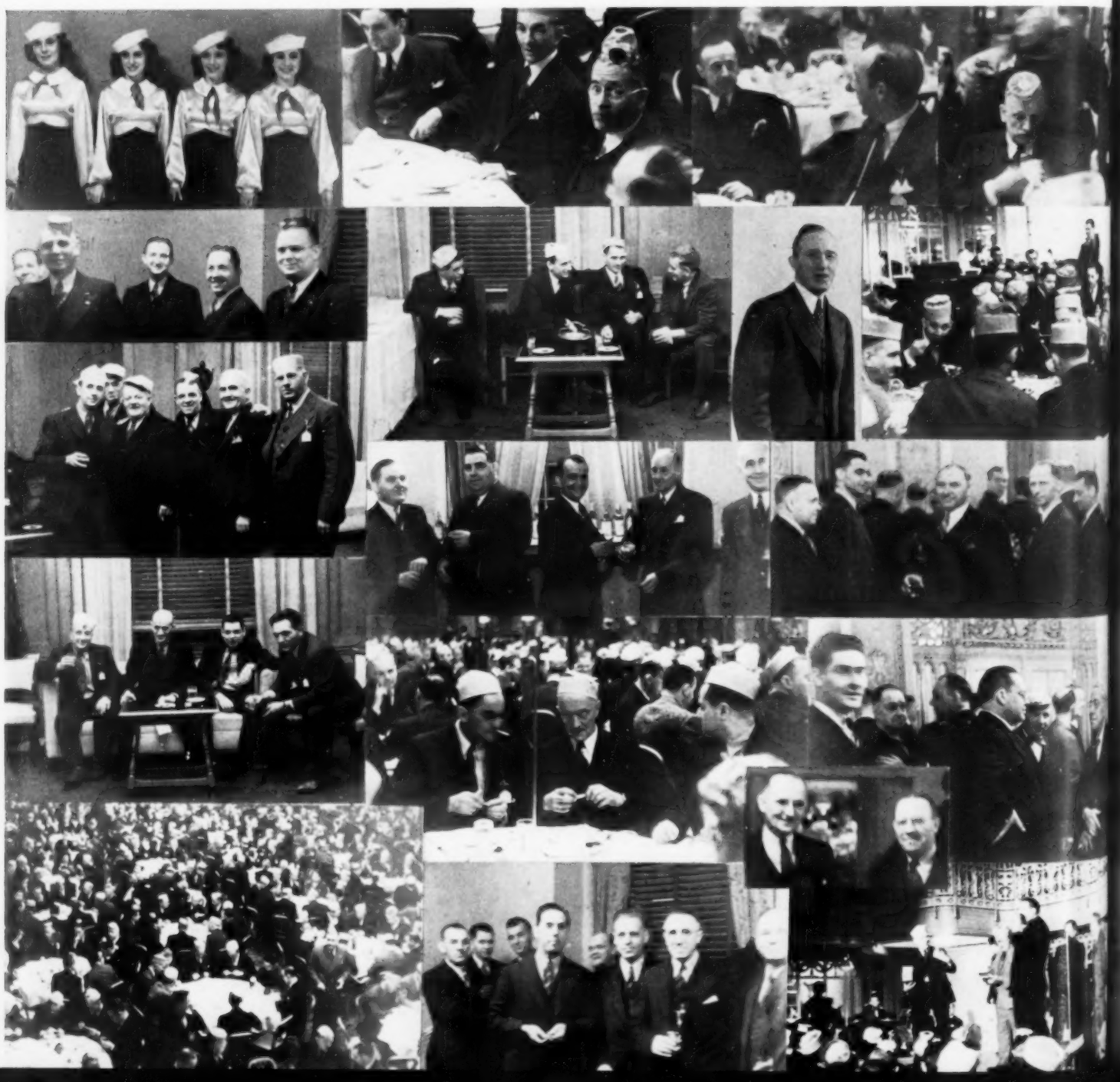
A fine attendance of nearly 300 members and guests included those from all the neighboring cities and towns embraced in the chapter and Messrs. Wheeler, Wright and Judson from the Central New York chapter together with Professor Davis of Cornell university were with us to help in the fun and stimulate interchapter cordiality.—*Eliot Armstrong, secretary.*

Pittsburgh

WITH nearly 800 members and guests present, the annual Christmas party of the Pittsburgh Foundrymen's association set new highs in attendance and entertainment on Dec. 16. The entertainment committee under the direction of W. S. Scott took care of all arrangements and provided a complete program. Held in Hotel William Penn, the party started off

(*Continued on page* 68)

Pittsburgh Foundrymen's association set new highs in attendance and entertainment at its Christmas party held on Dec. 16
Photos courtesy of Sterling Farmer, Sand Products Corp., Cleveland



"A CLEANER PRODUCT AND BETTER SANITARY CONDITIONS"

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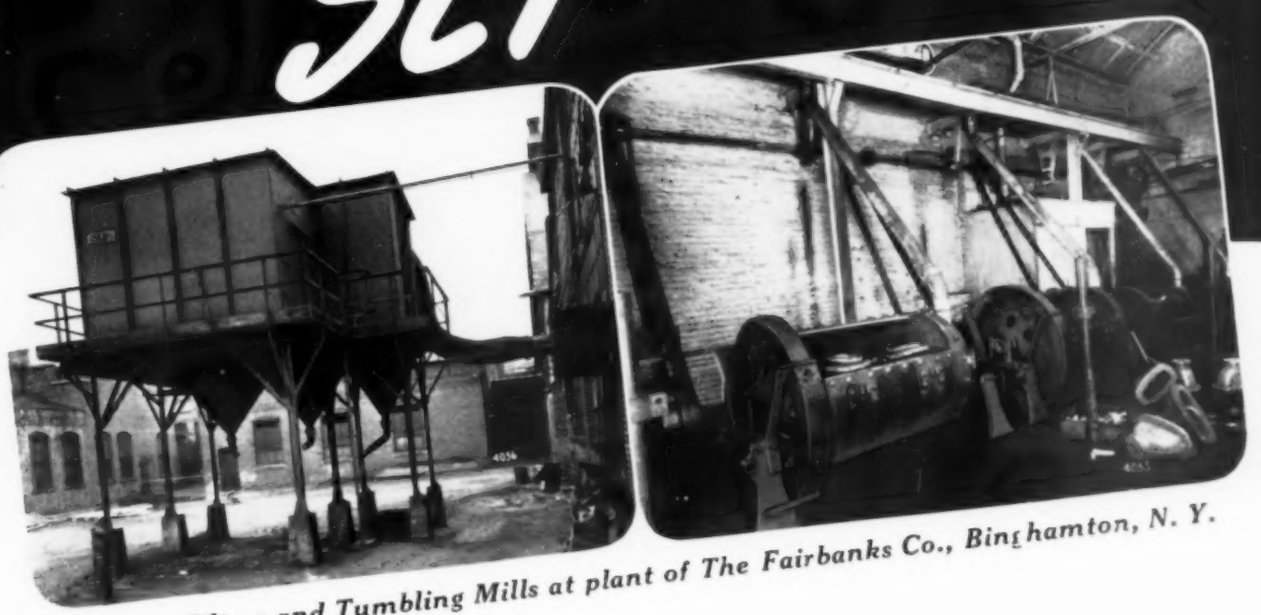

• *Sly Dust Filters and Tumbling Mills at plant of The Fairbanks Co., Binghamton, N. Y.*

THE Fairbanks Co. says that Sly Dust Filters have produced a cleaner product and better sanitary conditions, have improved operations in their iron and brass foundries and have resulted in many savings. Sly Dust Filters offer definite economies, particularly in low first cost and savings in space and power.

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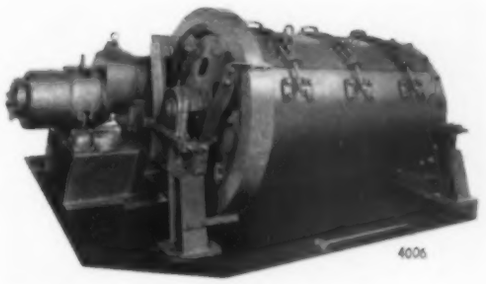

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● *including these important features:* Heavy forged steel trunnions, extra heavy roller bearings, massive benches ★ Special door locks—easily unfastened, hold door securely in place ★ Extra heavy Master Electric gearhead motor with Herringbone gears and magnetic brake ★ Integral motor platform ★ Mill pinion on motor shaft permits loading and unloading from either side

BLAST CLEANING EQUIPMENT **SLY** INDUSTRIAL DUST CONTROL TUMBLING MILLS

(*Continued from page* 66)
with a turkey dinner and all the fixin's. Entertainment was provided by artists from radio station KDKA, Pittsburgh. — *R. L. Hartford, chairman publicity committee.*

Conn. Nonferrous

AROUND table discussion on foundry problems, headed by T. Joseph Judge, Jenkins Bros., Inc., Bridgeport, and assisted by Ernest Stone, chairman of the problems committee, and Charles Knapp, chairman of the sand committee, featured the Dec. 18 meeting of the Connecticut Nonferrous Foundrymen's association, held at the Union League club, New Haven, Conn. A very lively discussion developed with the presentation of several problems connected with the production of nonferrous castings. As a special feature, colored movies were shown by Herbert Dingee.

The nominating committee consisting of Louis Bentz, chairman, George Winslow, George King, Owen Johnson, and Stafford Chappell Jr., presented a report which was adopted and the following officers were re-elected: President, D. Wesley Case, Belknap Mfg. Co., Bridgeport; vice president, Ernest F. Stone, Manning, Maxwell & Moore Co., Bridgeport; treasurer, Walter

(*Continued on page* 70)

Members and guests of the Pittsburgh Foundrymen's association enjoyed an excellent entertainment at the annual Christmas party. Photos courtesy of Sterling Farmer, Sand Products Corp., Cleveland

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(*Continued from page* 68)

J. Kenney, North & Judd Mfg. Co., New Britain; secretary, Louis G. Tarantino, 670 West Jackson avenue, Bridgeport; technical secretary, Frank B. Diana, Whipple & Choate, Bridgeport; executive committee, Chairman, Howard A. Phelps, Phelps Foundry Co., Ansonia; T. Joseph Judge, Jenkins Bros. Inc., Bridgeport; S. W. Chappell Sr., Electric Boat Co., Groton; George S. King, Malleable Iron Fittings Co., Branford, and Fred B. Clarke, Whitehead Bros. Co., Providence, R. I.

The Connecticut nonferrous association is enjoying large attendance at its regular meetings, with between 50 to 75 present at each event.—*Louis G. Tarantino, secretary.*

Michiana

FOUNDRY sands was the topic discussed by E. E. Woodliff, Harry W. Dietert Co., Detroit at the Jan. 7 meeting of the Michiana Chapter of the A. F. A. held at Hotel LaSalle, South Bend, Ind. M. F. Doty, Clark Equipment Co., Buchanan, Mich., and chairman of the chapter presided, and approximately 100 members and guests were present.

Mr. Woodliff pointed out that careful consideration should be given to the type of new sand purchased which should be suitable for the type of work being run in that particular foundry. Tests which can be made to determine suitability are: Grain size, clay content, durability, and sintering point, and the importance of each was explained. Cores were discussed in relation to types of core sands and types of binders. Slides were used in connection with the discussion by which the speaker showed the connection existing between casting defects and the various properties of molding sand and cores as exemplified by the various standard tests. The talk provoked a lively and interesting discussion.

J. H. VanDeventer, president and editor of the *Iron Age* will speak at the Feb. 12 meeting of the chapter which will be held jointly with the Notre Dame chapter of the A. S. M. and the South Bend association of commerce. The meeting will be held at the University of Notre Dame and the subject to be discussed will be, "Today's Challenge to the Engineering Profession."—*M. F. Surls.*

Central Indiana

REGULAR meeting of the Central Indiana Chapter of the A. F. A. Jan. 6 was held at the Washington hotel, Indianapolis with approximately 130 members and guests present and under the chairmanship of the president I. R. Wagner, vice president Electric Steel Castings Co., Indianapolis. An interesting and informative address on "Merit Rating" was presented by John F. Modrall, employment assistant, Eli Lilly Co., Indianapolis. In the question period following the formal address the speaker was assisted by E. H. Adriance, assistant to the director of the efficiency division.

At the Feb. 3 meeting J. A. Kayser will discuss "Foundry Refractories."—*R. A. Thompson, secretary.*

Cincinnati

SECOND annual Christmas party and dinner dance of the Cincinnati District Chapter of the A. F. A. was held on Saturday, Dec. 28, 1940, at the Kenwood Country club in Cincinnati. Despite extremely inclement weather, over 350 members, guests and their ladies attended. Everyone thoroughly enjoyed themselves to the utmost.

Due to the generosity of our supplier friends, we were able to distribute very handsome door prizes, and special prizes to the ladies. Furthermore, each lady and each gentleman who attended, received a valuable gift.

The dinner was followed by a very interesting and somewhat hilaricus floor show. The pictures reproduced in this issue show our dear Santa Claus, portrayed by George Seyler, general manager, Lunkenheimer Co.: Poor Santa Claus just 3 days after Christmas, and all in and down and out after his strenucus pre-Christmas arduous tasks—continually needed the *medical* libations administered to him by his attendant *aurse.*

A sincere vote of thanks is most certainly due our co-chairmen who were responsible for the success of this party: Billy Gilbert, president, Buckeye Foundry Co., and Larry Gosiger, district manager, S. Obermayer Co. Here's looking forward to our third annual affair next year, and with a warning that the com-

(*Continued on page* 73)

Views taken at the Christmas party of the St Louis chapter. Photos courtesy of Norman Persons, Miller & Co., St. Louis

(*Continued from page* 70)

mittee will have to go some to keep pace with the precedent established during the past two years since it will be hard to beat.

Members and guests to the number of 125 attended the Jan. 9 meeting of the Cincinnati Chapter of the A. F. A. at the Hotel Ames. This was a joint meeting of the chapter with the American Society of Metals and the American Society of Mechanical Engineers. Following the dinner, a 45 minute sound film "The Power Behind the Nation" was presented through courtesy of the Norfolk & Western railroad, telling the story of the production, transportation and use of coal.

Technical speaker of the evening was C. W. Briggs, Steel Founder's Society of America, Cleveland. In covering his subject "Design of Castings" Mr. Briggs considered the

More than 350 members and guests attended the second annual Christmas party held by the Cincinnati chapter at Kenwood Country club, Cincinnati, on Dec. 28

various features from two standpoints, that of the designing engineer and that of the foundryman. He stressed the importance of consulting the foundryman in the design of practically all steel castings. He listed the usual causes of defects directly traceable to design and with the aid of suitable slides, showed how these defects can be prevented.

Defects include hot tears, shrinkage cavities and cracks and in nearly all cases are the result of joining heavy and light sections. Shrinkage cavities obviously are produced in places where the supply of feeding metal is cut off through any one of many causes. The concluding part of his talk dealt with many foundry features and special methods adopted to insure solid castings from designs that vary a little, or to a considerable extent from the ideal.

The chairman announced that the next meeting will be at the Hotel Metropole, Feb. 11 when C. O. Burgess, Union Carbide & Carbon Research Laboratories, will discuss "Effect of Alloy Additions."—*Henry M. Wood, secretary.*

N. Ill.-S. Wis.

ANNUAL Christmas party of the Northern Ill.-Southern Wis. Chapter of the A. F. A. was held at Hotel Faust, Rockford, Ill., Dec. 7. Approximately 275 members and guests were present to enjoy a well rounded evening of food and entertainment. The Swedish smorgasbord was complete with everything imaginable to eat, and the floor show which followed left nothing to be desired.—*J. R. Cochran, technical secretary.*

Ontario

IN SPITE of bad driving conditions, about 80 attended the meeting of Ontario chapter of the A. F. A. on Nov. 29, at the Rock Garden lodge, Hamilton, Ont. Chairman D. M. Storey, Fittings Ltd., Oshawa, Ont. presided during the dinner. Following the dinner, three groups were formed to discuss gray iron, malleable and nonferrous foundry problems.

The nonferrous group was under the guidance of Joseph Sully, Sully Brass Foundry Ltd., Toronto. In discussing furnaces or melting units, it was stated that conditions and quantity of metal required, fuel available, and parts being made, all have a bearing on the selection of a melting procedure, and that almost any type of melting unit could provide good metal if properly controlled. Moisture content of sand should average in the range of 4 to 6 per cent. Class of sand, type and weight of casting, etc., have some bearing on the moisture that can be allowed safely. Materials in which extra interest has been aroused by war requirements include manganese bronze of 100,000 to 110,000 pounds tensile strength with 12 per cent elongation, and an aluminum alloy, containing zinc and copper, in which close control is required in meeting desired specifications.

The malleable iron section, arranged by T. A. Rice, International Harvester Co. of Canada Ltd., Hamilton, was under the leadership of H. F. Davis, metallurgist of that organization. Mr. Davis gave a detailed discussion of a new type of malleable introduced from England to meet the requirements of certain specifications. The principal feature is the combination of the usual ductility with a very hard surface. Melting methods are similar to normal malleable iron and the unusual hardness is attained by subsequent treatments.

Joint leaders of gray iron group were O. W. Ellis, Ontario Research foundation, and J. C. Stavert, metallurgist, Babcock-Wilcox-Goldie-McCulloch, Ltd. Mr. Ellis discussed production of small wire grips with which some trouble has been encountered. At the foundation, it was noticed that a 3 per cent carbon, 1½ per cent silicon, 6 per cent manganese iron possessed a structure which might be suitable for these grips. Grips of that material will give slightly, but their teeth harden on working to grip the wire even more firmly. At first in casting the grip from the manganese steel, difficulties were encountered with blunt teeth, and the appearance of a greenish slag. Raising the flowing temperature did not improve the situation, and finally the pouring temperature was lowered as far as possible to about 2450 degrees Fahr. when perfect grips were produced with sharp teeth, and the operation was free from slag. It was believed that the slagging might be due to a reaction between the manganese and silica sand at high temperature. Cost of the manganese steel grips is very favorable when compared with grips produced by machining 0.90 per cent carbon steel, and heat treating.

In a discussion of super-machinable iron, led by J. C. Stavert, and originating out of the recent paper presented by Herbert H. Fairfield, bureau of mines, Ottawa, before the chapter, the question of a ferritic layer for machinability was raised. It was pointed out that, by proper combination of cooling rate and carbon-silicon ratios, it should be possible to produce a layer high in ferrite and low in carbon.—*G. L. White, secretary-treasurer.*

Wisconsin

A CAPACITY crowd of 602 members and guests attended the Wisconsin Chapter of the A. F. A. Christmas party held Dec. 20, 1940 at the Schroeder hotel, Milwaukee. An excellent dinner and an 8-act floor show was enjoyed to the fullest extent by the record breaking gathering. Among those attending were C. E. Hoyt, executive vice president of the A. F. A., Herbert S. Simpson, president, National Engineering Co., Chicago, and vice president of the A. F. A., and E. O. Jones, director of safety and hygiene section of the A. F. A.

The entertainment committee consisted of the following: Arthur Haack, Wisconsin Gray Iron Foundry, chairman; E. N. Carpenter, Carpenter Bros., Inc.; Frank Kulka, Motor Castings Co.; S. A. Pankratz, Quality Aluminum Co.; J. G. Risney, International Molding Machine Co.; Nels Spidell, Sand Products Corp.—*H. C. Waldron, secretary.*

New Jersey

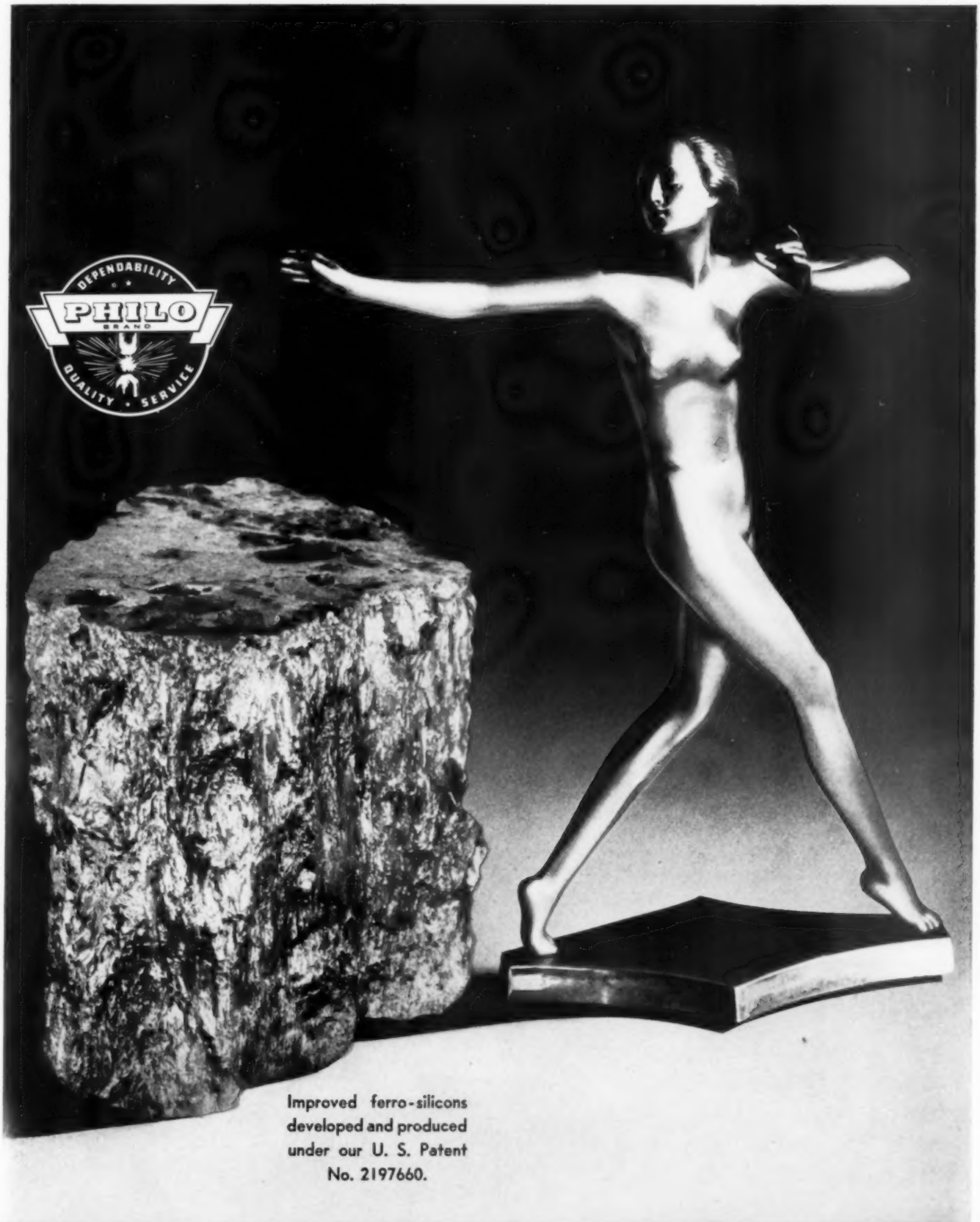
IMPORTANCE of desulphurizing ladles, both for decreasing the sulphur content and for providing more uniform chemical analysis, was stressed by V. A. Crosby, metallurgical engineer, Climax Molybdenum Co., Detroit, before members of the New Jersey Foundrymen's association at the Downtown club, Newark, N. J., Dec. 17. In a discussion which covered various phases of cast iron melting practice, the speaker suggested utilization in general of the principal of lower silicon, and the addition of late graphitizing agents, such as ferrosilicon, V-5, C. M. S. Z., ferrocarbo and others which are available on the market.

Another program feature was the presentation by A. W. Laytham, William P. Laytham & Sons Co., Paterson, N. J., of a 10-minute color film of a week-end fishing trip last summer during which he caught three swordfish totaling more than 1300 pounds.

Mr. Crosby discussed the more economical procedures in the melting and controlling of cast iron by means of the cupola, electric furnace and air furnace, the latter two finding their chief usefulness, in his opinion, in duplexing operations in large foundries. With aid of lantern slides the speaker presented detailed mixtures for various grades of iron from 35,000 to 60,000 pounds per square inch, and in every case suggested the use of some form of late graphitizer to improve the quality of the iron.

He discussed also the advantages

(*Continued on page 76*)



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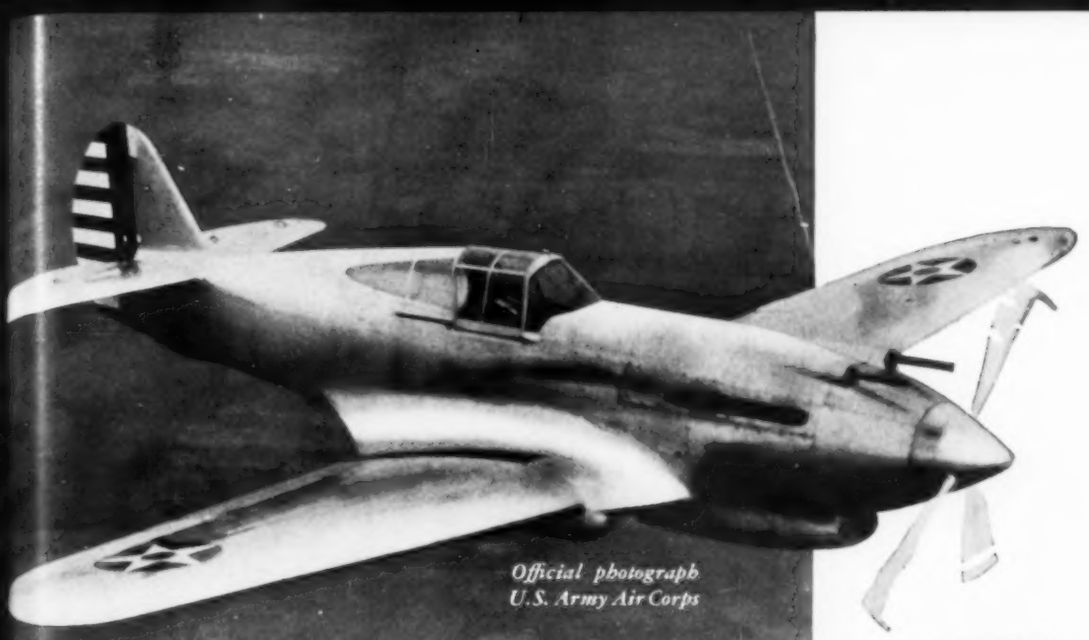
Canton, Ohio

(*Continued from page* 74)
of securing the right type of graphitic structure, referring to variation in graphite pattern as a function of the cooling rate, and as such a matter quite difficult to control in various sections of a casting. The small sections, he declared, are quite dendritic with the large sections having a normal or random type graphite. Change in graphitic structure, Mr. Crosby declared, may effect tensile strength as much as 12,000 pounds per square inch or 35 per cent and impact or resistance to shock to an even greater degree—chemical analysis remaining constant.

The character of raw materials, he said, has a pronounced effect on

(*Continued on page* 78)

A capacity crowd of 602 members and guests attended the annual Christmas party of the Wisconsin chapter held at the Schroeder hotel, Milwaukee. Photos courtesy of John Bing, A. P. Green Fire Brick Co., Milwaukee



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(*Continued from page 76*)

the tensile strength and hardness of cast iron.

Mr. Crosby discussed advantages of alloy iron over plain iron in meeting certain requirements, such as better wear resistance, heat resistance, toughness and to a mild degree, corrosion resistance.

The specific effects of molybdenum in cast iron were enumerated along lines of published data which indicated briefly that a marked increase can be expected in transverse, tensile, deflection and impact and a mild increase in chilling effect and brinell hardness. With the exception of the super strength irons (80,000 pounds per square inch using 1 per cent Mo) only small amounts (0.30-0.60 per cent) are required to produce remakable results, he said.

Slides were shown illustrating the effect of molybdenum on hardenability of cast irons subject to heat treatment. A greater degree of uniformity and freedom from cracks can be attributed to molybdenum, he said. The speaker also displayed a number of slides illustrating molybdenum alloy castings now in the service, such as cast cam and cam shafts, gears, pumps and so forth.—*Ben K. Price.*

N.E. Ohio

APPROXIMATELY 125 members and guests of the Northeastern Ohio Chapter of the A. F. A., heard George S. Evans, research metallurgist, Mathieson Alkali Works, Inc., New York, discuss many phases of cupola control and operation at the Jan. 9 meeting in the ball room of the Tudor Arms, Cleveland. His talk was preceded by a clever and witty presentation of an illustrated lecture on "Cockeyed Patents I Have Known" by W. G. Soley, Carborundum Co., Niagara Falls, N. Y.

Immediately after the dinner the group of boys awarded prizes in last year's A. F. A. foundry and pattern-making contest were introduced together with a company representative, and the firms were presented with bronze plaques to be set up in the respective plants. The plaques described and illustrated in the Jan. issue of THE FOUNDRY, bearing the boy's name and the name of the firm were presented to the companies represented by the following winners: John Burczky, Master Pattern Co.; William Theis, Warner & Swazey Co.; Albert Jazbinski, Western Pattern Works; Peter Palshook, Gluntz Brass Foundry Co.; Louis Taus, Aluminum Co., of America; John Jasso, Wellman Bronze & Aluminum Co.; S. Marcysiak, West Steel Casting Co.; Robert Darmour and J. Birkenheuer, Crucible Steel Casting Co.; W. Wehagan, Atlas Foundry Co.; L. Simeon, Hill-Acme Co.; C. Blacksmith, Bowler Foundry Co.

Mr. Evans devoted the first part of his talk to an explanation of the functions and purpose of the recently organized cupola research committee of the A. F. A. working in conjunction with the Battelle Memorial institute, Columbus, O. The second part of his talk, covered theory and practice of cupola operation with particular reference to fluxing and desulphurizing the metal. He touched upon conditions which led up to the formation and to the belief that a program of this kind will remove most of the mysteries from cupola control and enable foundrymen to produce consistently better castings at a reduction in cost. He instanced the remarkable results directly traceable to the sand research program initiated about 20 years ago by the A. F. A.

The speaker discussed slags and fluxes from theoretical and practical standpoints. He advocated the use of a flux on the bed charge and on all succeeding charges. Slag plays an important part in the operation of a cupola. A good, fluid slag is essential to clean operation. In this connection he referred to a prominent midwest automobile foundry which in a short time paid for an expensive installation of a scrap cleaning device (THE FOUNDRY for May, 1940, page 96). As a result of tumbling all sprues and scrap for the cupola charge the amount of fluxing material was reduced to approximately one half the former amount, power for the blower was reduced and the silicon melting loss was reduced by 10 points.

Mr. Evans described many of the characteristics and reactions of the usual fluxing materials, dolomite, limestone, fluorspar, marble. Fluorspar is more of a liquefier than a flux. Some stone breaks up so small that it is blown out of the cupola. He referred briefly to the action of soda ash as a desulphurizer. In the question period following his talk he elaborated on the proper size of ladles and other features connected with desulphurizing metal. Under exceptionally favorably conditions the amount of sulphur may be reduced 40 per cent.—*Pat Dwyer.*

Nor. Iowa

ANNUAL ladies night and Christmas party of the Northern Iowa Foundrymen's association was held at Black's Tea room, Waterloo, with an attendance of approximately 90 members, their ladies and guests. A musical program preceded the showing of colored moving pictures of the activities at the Northern Iowa Foundrymen's picnic held at the Rotary reserve in July. These moving pictures were taken and shown by Ed Jochumsen, Litchfield Foundry, Waterloo, and provided many laughs for the ladies as well as the active participants at the picnic. It is planned to make this a permanent feature for future picnics, providing a valuable as well as entertaining record for the association. Frank Quinn, Waterloo, concluded the program with the singing of familiar Christmas carols.—*R. E. Wilke, secretary.*

Metropolitan

SPECIAL alloys now in great demand for defense work came in for special discussion by William Romanoff, technical superintendent, H. Kramer & Co., Chicago, in his remarks on modern brass foundry practice before members of the Metropolitan chapter of the A. F. A. at the Essex house, Newark, N. J., Monday evening, Jan. 8.

These alloys, the speaker said, are aluminum bronze, manganese bronze, government bronze, nickel silver and nickel alloys and high lead bronze. He outlined the various applications from these alloys and made suggestions as to precedure in the production of castings from them. Mr. Romanoff discussed such phases of practice as melting, pouring temperature, gating and sand conditions.

The manufacture of nonferrous ingots was briefly discussed, particularly the method for the elimination or reduction to within specified limits of impurities. Examples were given to illustrate how defects which were blamed upon metal, could have been eliminated by proper foundry practice. Many members took part in the discussion.—*Samuel Frankel.*

New England

ANNUAL meeting of the New England Foundrymens' association was held Jan. 8 at the Hotel Gardner, Boston with approximately 200 members and guests present. With president Frances LeBaron in the chair the nominating committee, Walter Saunders, Jr., Providence; Henry Jensen, General Electric Co., West Lynn and A. S. Wright, Hunt Spiller Mfg. Corp., South Boston, submitted the following list of officers for the coming year: President, Charles O. Butler, Warren Pipe Co. of Mass., Inc., Everett, Mass.; vice president, Raymond Meader, Whitin Machine Co., Whitinsville, Mass.; treasurer, Arthur W. Gibby, Condor Press, East Boston; secretary, Ernest F. Stockwell, Barbour-

(*Concluded on page 80*)

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(*Continued from page* 78)

Stockwell Co., Cambridge, Mass. They were elected unanimously. Officers of the executive committee include: Raymond Meader, Whitin Machine Co.; Augustus W. Calder, New England Butt Co., Providence; D. Frank O'Connor, Walworth Co., South Boston; T. C. Weiser, Griffin Wheel Co., Chelsea; M. A. Hosmer, Hunt-Spiller Mfg. Corp., South Boston; Charles A. Reed, Rogers-Brown-Lavino Co., Cambridge Mass. In addition to the dinner and election of officers the program included a long list of entertainment features.—*M. A. Hosmer.*

Central New York

December meeting of the Central New York Chapter A. F. A., was held Dec. 13 at the Onondaga hotel, Syracuse, N. Y. under the chairmanship of the president Frank Wheeler. Following the dinner the membership committee through chairman Harold Boardman reported a further increase in the chapter membership.

The technical session was covered by Harry Dietert, president H. W. Dietert & Co., Detroit, who discussed many phases of the perennial and highly complicated subject of foundry sand for molds and cores. The talk was the third in a series which Mr. Dietert prepared and delivered before the central New York chapter. The first two lectures dealt to a considerable extent with sand characteristics, testing equipment, methods of interpreting test results, and methods for controlling the sand in the shop. Several defective castings were circulated through the audience for examination while Mr. Dietert explained the cause of the defect and the proper remedy to apply. Lantern slides showed how sand reacted in the presence of high temperature metal.—*L. D. Wright, secretary.*

Chicago

ON MONDAY evening, Jan. 13, an unusually large crowd of foundrymen attended the regular monthly meeting of the Chicago Chapter of the A.F.A.

To this large and enthusiastic gathering the program committee presented Allan H. Mogensen, who spoke on the subject, "Work Simplification and National Defense." Mr. Mogensen presented his ideas in a very clear and forceful manner illustrating several of his points by means of motion pictures. He stated that there were many obstacles in increasing productivity in any plant. Among these were: Natural resentment of criticism; not knowing how to work; and not being enthused about the job. Mr. Mogensen addressed part of his remarks to the foundry industry and pointed out that waste in that trade was very considerable. He illustrated by stating that for every pound of castings sold the plant must handle 800 pounds of equipment and material.

He suggested that each man present examine his own plant and productive steps with the question, "Is this necessary?" foremost in the investigation. In this connection he stated that every job has three parts: Make ready; do and clean up. All other acts are superfluous.

Foundrymen most interested in work simplification should study their problems by means of close observation and then proceed to correct them. Mr. Mogensen advised that all plants have the brains in their own organization to solve these problems and urged executives to encourage suggestions from employes. Prior to Mr. Mogensen's talk the foundrymen were entertained by sleight of hand, while following the address there was a question period.—*Bruce L. Simpson, secretary.*

University Stages Foundry Review

Under the guidance of Professor Fulton Holtby and planned and organized in accordance with the wishes of foundrymen in the Twin City area, the annual institute sponsored by the foundry division of the University of Minnesota was held Dec. 5, 6 and 7 at the center for continuation study. Sales, costs and cupola practice were discussed at the various sessions. The institute was conducted as a university class with definite lecture periods, class discussions and a certificate as evidence of attendance.

W. W. Rose, executive vice president, Gray Iron Founders' society, Cleveland, explained what is wrong with present casting sales methods and pointed to methods that should be adopted. In this connection he directed attention to the importance of careful estimating, sound pricing and accurate cost systems and records. Selling castings by the pound instead of by the piece is a left over relic of a former era when conditions in the general industrial and commercial world differed radically from those prevailing at present. The pound selling principle is as outmoded as bustles, celluloid collars and kerosene lamps and should be sent to the limbo of forgotten things to join these other objects of derision. The speaker referred to the qualifications of a casting salesman and outlined the course of instruction required to convert prospective salesmen into competent performers. In the speaker's opinion, chronic inability of the foundryman to say "No" when a prospective customer demands a lower price is the cause of high consumption of red ink by the accounting department.

Albert E. Grover, widely known cost accountant and member of the advisory staff of THE FOUNDRY explained in great detail the fundamental principles of estimating costs and the establishment of cost systems. He presented a preview of the latest cost system he has developed and in a 4-hour round table discussion contributed a great fund of information in reply to questions from cost conscious accountants and foundry executives. R. G. Leicht, Winona Machine & Foundry Co., described the establishment and operation of the cost system in his foundry.

Donald J. Reese, International Nickel Co. Inc. New York, contributed two lectures on cupola control and operation with particular application to the cost feature. He presented a wide range of items responsible for higher costs and then explained the proper remedial measures to adopt to secure maximum efficiency, minimum costs and smoothness of operation in the production of high quality castings.

John Diedrich, general manager Blackhawk Foundry & Machine Co., Davenport, Ia., lectured on job evaluation and sound costing. The talk was illustrated by actual case histories of increased production, improved product and sounder pricing. In one instance a change in design decreased production costs and increased the efficiency of the castings.

At the institute banquet, Herbert J. Miller, Minnesota Resources committee stressed the importance of apprenticeship training in connection with the national defense program. The local foundry industry is engaged in the formulation of a program along the lines indicated. The University of Minnesota is preparing to sponsor a similar institute in the spring or early fall.

Plan West Michigan Second Meeting

A second meeting of members of the American Foundrymen's association in western Michigan will be held at the Hotel Occidental, Muskegon, on Monday, Feb. 3, to take further steps in the formation of a chapter. Speaker of the evening will be L. P. Robinson, sales man-

(*Concluded on page* 83)

(*Concluded from page* 80)
ager, Werner G. Smith Co., Cleveland, and a director of the A.F.A., who will talk on, "Some Common Core Room Problems."

A local committee handling the details of the chapter formation consists of the following: Chairman, D. F. Seyferth, West Michigan Steel Foundry Co., Muskegon; E. W. Beach, Campbell, Wyant & Cannon Foundry Co., Muskegon; Max Amos, Standard Automotive Parts Co., Muskegon; J. O. Ostergren, Lakey Foundry & Machine Co., Muskegon; Paul S. Lane, Muskegon Piston Ring Co., Muskegon.

The final organization meeting and the election of officers probably will be held on March 13. A. W. Gregg, Whiting Corp., Harvey, Ill., will discuss "Cupola Practice," at that gathering.

Wisconsin Regional Is Arranged

Fourth annual regional conference of the Wisconsin chapter in cooperation with the college of engineering, University of Wisconsin will be held at the Schroeder hotel, Milwaukee, on Thursday and Friday, Feb. 20 and 21. The meeting will stress national defense, and speakers of national prominence included in the program are: Hon. Martin Dies, member of Congress and chairman of the committee on un-American activities, who will talk on "Subversive Activities"; Gen. N. F. Ramsey, Rock Island arsenal, Rock Island, Ill., who will describe work in the arsenal; Victor L. Short, president, Institute of Human Science, Springfield, Mass., who will discuss employer-employe relations; L. V. Boardman, Federal bureau of investigation, Milwaukee, who will speak on sabotage, and Mayor Carl Zeidler, Milwaukee, who, will talk on "Industrial Development."

Discussion leaders of ability have been selected for the four sectional groups on gray iron, steel, malleable cast iron, and nonferrous founding, and the program has been arranged to provide an opportunity for discussion and study of the manufacture and application of castings. The tentative program follows:

GRAY IRON DIVISION

Thursday, Feb. 20

10:45 a.m. to 12:00 m.—"Production and Job Patterns," by Vaughan Reid, City Pattern Works, Detroit.

1:45 p.m. to 3:20 p.m.—"Characteristics of Binders in Various Core Sands," by Joseph Gitson, Delta Oil Products Co., Milwaukee.

Friday, Feb. 21

9:00 a.m. to 10:15 a.m.—"Methods of Production Molding and Jobbing Molding," by Anthony Lebesch, Allis-Chalmers Mfg. Co., West Allis, Wis.

10:30 a.m. to 12:00 m.—"Melting Practice for Jobbing and Production," by William Brooks, Allis-Chalmers Mfg. Co., West Allis, Wis.

1:45 p.m. to 3:20 p.m.—"Methods in Cleaning Room Inspection," by John Harris, Spring City Foundry Co., Waukesha, Wis., and "Methods of Salvaging Castings," by Herbert Quartz, Allis-Chalmers Mfg. Co., West Allis, Wis.

MALLEABLE DIVISION

Thursday, Feb. 20

10:45 a.m. to 12:00 m.—"Efficient Malleable Melting Practice," by Phillip DeBruyne, Moline Malleable Iron Co., St. Charles, Ill.

1:45 p.m. to 3:20 p.m.—"Foundry Sand," by Bert Stone, Belle City Malleable Iron Co., Racine, Wis.

Friday, Feb. 21

9:00 a.m. to 12:00 m.—"Scrap Clinic," board of experts—Edward Myer, Chain Belt Co., Milwaukee; Fred Voelkel, Federal Malleable Co., West Allis, Wis.; Myron Weaver, General Malleable Corp., Waukesha, Wis.; V. F. Gapinski, Milwaukee Malleable & Gray Iron Works, Milwaukee; Peter Stoesser, Badger Malleable Co., South Milwaukee, Wis.; Russel Anderson, Belle City Malleable Iron Co., Racine, Wis.; William Hoernke, Wisconsin Appleton Co., South Milwaukee, Wis., and Martin Harder, Lakeside Malleable Casting Co., Racine, Wis.

1:45 p.m. to 3:20 p.m.—"The Selection of Molding and Coremaking Equipment for Economical Production," by W. R. Jennings, John Deere Tractor Co., Waterloo, Iowa.

STEEL DIVISION

Thursday, Feb. 20

10:45 a.m. to 12:00 m.—"Flowability of Cast Steel," by Dr. C. H. Lorig, Battelle Memorial institute, Columbus, O.

1:45 p.m. to 3:20 p.m.—"Controlled Directional Solidification in Steel Castings," by Stanley W. Brinson, Norfolk Navy yard, Norfolk, Va.

Friday, Feb. 21

9:00 a.m. to 10:15 a.m.—"Heading and Gating," by H. A. Forsberg, Continental Roll & Steel Foundry Co., East Chicago, Ind.

10:30 a.m. to 12:00 m.—"Gamma Ray Inspection of Steel Castings," by Dr. Gilbert E. Doan, Lehigh university, Bethlehem, Pa.

1:45 p.m. to 3:20 p.m.—"Foundry Maintenance," by James Thomson, Continental Roll & Foundry Co., East Chicago, Ind.

NONFERROUS DIVISION

Thursday, Feb. 20

10:45 a.m. to 12:00 m.—"Navy, Federal and Air Corps Specifications," by Lt. H. M. Marshall, and Nicholas Elliot, Milwaukee Navy Inspection office, and "Ordnance Inspection," by Paul Cunnick and H. A. Curtis, Rock Island arsenal, Rock Island, Ill.

1:45 p.m. to 3:20 p.m.—"Metallurgy of Aluminum Alloys and Castings," by G. H. Starmann, Apex Smelting Co., Chicago.

Friday, Feb. 21

9:00 a.m. to 10:15 a.m.—"Crucible Melting," by D. B. Millard, Electro Refractories & Alloys Corp., Buffalo, N. Y.

10:30 a.m. to 12:00 m.—"Nonferrous Foundry Cost Systems," by Ralph Lee, Liberty Foundry Co., Wauwatosa, Wis.

1:45 p.m. to 3:20 p.m.—"Top Pouring Methods for Some Nonferrous Alloys," by A. K. Higgins, Allis-Chalmers Mfg. Co., West Allis, Wis.

JOINT MEETINGS

Thursday, Feb. 20

10:00 a.m. to 10:30 a.m.—Address of welcome by F. Ellis Johnson, dean, college of engineering, University of Wisconsin, Madison, Wis.

12:10 p.m. to 1:30 p.m. — Luncheon. Speaker: Mayor Carl Zeidler, Milwaukee.

3:30 p.m. to 5:00 p.m.—Speaker: Victor L. Short, Institute of Human Science, Springfield, Mass.

6:30 p.m.—Dinner. Speaker: Hon. Martin Dies, member of Congress, Washington.

Friday, Feb. 21

12:10 p.m. to 1:30 p.m.—Luncheon. Speaker: Gen. N. F. Ramsey, Rock Island arsenal, Rock Island, Ill.

3:30 p.m. to 5:00 p.m.—Speaker: L. V. Boardman, Federal Bureau of Investigation, Milwaukee.

Three Plants Form Grede Foundries

Grede Foundries Inc., Wauwatosa, Wis., recently was formed as a merger of the Liberty Foundry Inc., Wauwatosa; the Spring City Foundry Co., Wauwatosa, and the Milwaukee Steel Foundry Co., Milwaukee. The new organization has a capitalization of $1,000,000, and the three companies will become divisions of Grede Foundries Inc. The move has been made to simplify the corporate structure and to co-ordinate the management of the three plants for more comprehensive service to customers.

William J. Grede

William J. Grede, formerly president of Liberty Foundry Inc., and Spring City Foundry Co. is the new president of Grede Foundries Inc. and will continue as chairman of the Milwaukee Steel Foundry division. B. C. Waite continues as president and treasurer of the Milwaukee Steel Foundry division and is treasurer of Grede Foundries Inc. Arthur L. Grede, formerly vice president of Liberty Foundry Inc. and secretary of Spring City Foundry Co., is vice president and secretary of Grede Foundries Inc. and will continue as vice president and secretary of the Milwaukee Steel Foundry division. H. P. Kreulen, formerly vice president and treasurer, Spring City Foundry Co., is vice president in charge of Spring City Foundry divi-

sion. Ralph H. Lee, formerly secretary and treasurer of the Liberty Foundries Inc., is comptroller for Grede Foundries Inc. and the Milwaukee Steel Foundry division. John W. Perry Jr. will continue to direct sales and Oscar Woehlke and James J. Ewenes will continue as superintendents of the Liberty Foundry division and the Milwaukee Steel Foundry division, respectively.

The three foundries now are operating at capacity with building and equipment extensions under way at each plant. Although no prime defense contracts have been received, each of the foundries is producing a large volume of priority defense work from regular customers. The three plants now are employing a total of approximately 765 people, and have a total capacity of 41,000 tons of castings annually.

Steel Group Elects New Officers

The new board of directors of Steel Founders' Society of America at the organization meeting held in New York on Jan. 8, re-elected Donald C. Bakewell, vice president, Union Steel Castings division of Blaw-Knox Co., Pittsburgh, as president of the society. Oliver E. Mount,

Donald C. Bakewell

vice president, American Steel Foundries Chicago, was elected vice president.

The new executive committee includes Mr. Bakewell, Mr. Mount, and Lee C. Wilson, general manager, Reading Steel Castings division of the American Chain & Cable Co. Inc., Reading, Pa.

In addition to the members of the executive committee, the following are members of the new board: J. A. Sauer, vice president, Symington Gould Corp., New York; F. G. Russell, president, Florida Machine & Foundry Co., Jacksonville, Fla.; C. W. Howat, district sales manager, Duquesne division of Continental Roll & Steel Foundry Co., Pittsburgh; F. K. Donaldson, superintendent, Machined Steel Casting Co., Alliance, O.; C. L. Harrell, vice president, Sterling Steel Casting Co.,

Oliver E. Mount

East St. Louis, Ill.; I. L. Johnson, president, Pacific Steel Casting Co., Berkeley, Calif.

Col. Merrill G. Baker was reappointed executive vice president and Raymond L. Collier was reappointed secretary-treasurer.

To Hold Conference At Boston

The fifth annual New England foundry conference will be staged at Massachusetts Institute of Technology, Cambridge, Mass., Friday and Saturday, March 28 and 29, under the joint sponsorship of the New England Foundrymen's association, Massachusetts Institute of Technology, the Connecticut Foundrymen's association and the Connecticut Nonferrous Foundrymen's association.

A joint committee planning the affair includes the following: Chairman, A. S. Wright, Hunt-Spiller Mfg. Corp., South Boston, Mass.; vice chairman, Walter M. Saunders Jr., Providence, R. I.; James D. Coltman, Bullard Machine Co., Bridgeport, Conn.; Frank Eliott, Westinghouse Electric & Mfg. Co., Springfield, Mass.; E. E. Hall, Saco-Lowell Shops, Biddeford, Maine; Prof. P. E. Kyle and Prof. J. M. Lessells, Massachusetts Institute of Technology, Cambridge; D. Frank O'Connor, Walworth Mfg. Co., South Boston; Howard A. Phelps, Phelps Foundry Co., Ansonia, Conn.; LeRoy M. Sherwin, Brown & Sharpe Mfg. Co., Providence; Henry G. Stenberg, Rice Barton & Fales Co., Worcester, Mass.; Louis G. Tarantino, Connecticut Nonferrous Foundrymen's association, Bridgeport.

The tentative technical program for the conference is as follows:

Friday, March 28

9:00 a.m. Registration
10:15 a.m. Opening Addresses
10:30 a.m. Technical Session—Job Evaluation
12:30 p.m. Luncheon
2:00 p.m. Nonferrous Session involving a discussion of aluminum castings
3:30 p.m. Technical Session — Discussion of "Casting Design."
6:00 p.m. Conference Dinner.

Saturday, March 29

9:00 a.m. Registration
10:00 a.m. Technical Session—paper on "Foundry Sands."
12:30 p.m. Luncheon
2:00 p.m. Nonferrous Technical Session
3:30 p.m. Discussion of "Rigging for Foundry Production."
5:00 p.m. Adjournment.

Birmingham To Hold Ninth Conference

The ninth annual foundry practice conference of the Birmingham District Chapter of the American Foundrymen's association will be held at the Tutwiler hotel, Birmingham, Thursday and Friday, Feb. 27 and 28. The conference, which is the largest foundry affair of the year in the South and consistently has established new records of attendance, will feature a technical program offering a variety of subjects, an entertainment program on Thursday evening, Feb. 27, and the annual banquet of the conference on Friday evening, Feb. 28.

The tentative technical program is as follows:

Thursday, Feb. 27

9:00 a.m.—Registration, Lobby Tutwiler hotel.
10:00 a.m.—First Technical session.
12:30 p.m.—Luncheon, J. A. Bowers presiding.
2:30 p.m.—Technical session. Speaker, Garnet P. Phillips, chief metallurgist, Automotive Foundry division, International Harvester Co., Chicago. Subject: Automotive Cast Iron.
4:00 p.m.—Technical session. Speaker, Dr. C. H. Lorig, director of research, Battelle Memorial institute, Columbus, O. Subject: Carbon in Cast Iron.
7:00 p.m.—Entertainment—Joe Gilbert, Stockham Pipe Fittings Co., Chairman.

Friday, Feb. 28

9:00 a.m.—Plant Visitation.
2:00 p.m.—Technical session. Speaker, J. A. Bowers, melting superintendent, American Cast Iron Pipe Co., Birmingham, Ala. Subject: Refractories.
3:30 p.m.—Technical session. J. E. Jackson, metallurgist, Copper, Iron and Steel Development association, Cleveland. Subject: Alloy Effect of Copper Cupola Cast Iron.
7:00 p.m.—Annual Banquet.

Institute of British Foundrymen, with headquarters at St. John Street Chambers, Deansgate, Manchester, 3, England, recently announced that powers had been secured to dispense with the necessity for holding annual general meetings during the war.

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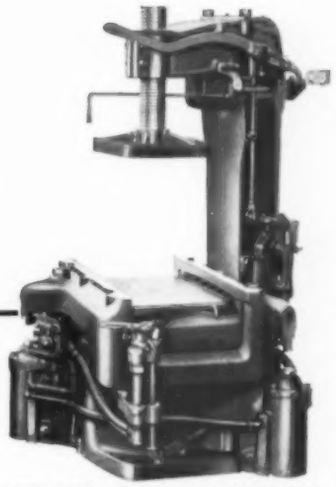

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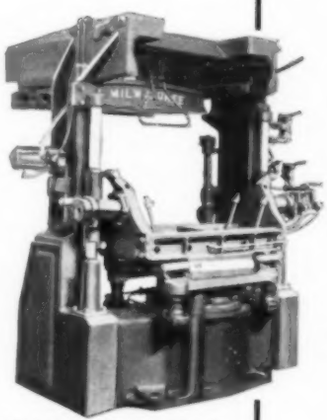

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FOUNDRY DEVELOPMENTS AT SHORT RANGE

HIGH speed tests, which reveal how metals *creep* and *relax* during many years service in steam turbines, motors and other machines, were developed in 1940 by Dr. A. Nadai and his associates at Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Tests are being carried out to meet demands of steam turbine builders faced with the task of making parts which will stretch less than 0.1 per cent during 10 years grueling service at a temperature of 1000 degrees Fahr. Dr. Nadai's new constant strain rate machine can make several measurements ranging from 15 minutes to several days which will reveal those effects as compared to former methods requiring 3 to 6 months.

In a typical test with the machine, a sample bar of cast carbon steel ½-inch in diameter was stretched 10 per cent of its length in 4 minutes by a pulling force which gradually increased to 12,000 pounds. A 9000-pound force stretched an identical piece the same amount in 4 days. Temperature was kept at 850 degrees Fahr. The automatic relaxation machine also was used to study how bolts in turbines and gasoline engines *relax* under stress and become loose.

* * *

Failure of oil, powdered coal, and luminous gas flames may be guarded against by a photoelectric eye device. Response to flames of different luminosities may be changed so that in the maximum position the device will respond to the light of a candle. It also includes a time lag in the relay operation so that flame disturbances do not cause unnecessary shut downs.

* * *

Two quite prevalent causes of defective copper-base castings are lack of feeding and gas absorption, and they may be distinguished by examination of the fracture. Lack of feeding is indicated by localized discoloration of the fracture with a clear outline of the crystalline structure. Gassing is shown by an even distribution of small holes with larger ones outcropping in the heavier sections, and an absence of outlined crystals. In mild cases use of a magnifying glass will aid in determining the cause of the defective casting.

* * *

A WEST Coast manufacturer of diesel engines employs a chromium-molybdenum cast iron for cylinder liners, cylinder heads and pistons which must resist growth and wear, and possess strength at elevated temperatures. The analysis of the iron shows 1.80 to 2.00 per cent silicon, 0.60 to 0.70 per cent manganese, 3.30 to 3.40 per cent total carbon, 0.25 to 0.30 per cent chromium, and 0.60 to 0.70 per cent molybdenum.

* * *

Ink for writing on brass, which may have many uses around the plant and laboratory, can be made by rubbing 2 ounces of copper carbonate with a little water and adding sufficient ammonia solution (10 per cent) to dissolve the copper salt. Then add 10 per cent glycerine, and the solution is ready for use.

* * *

CAPACITORS installed for power-factor correction in a Midwestern foundry manufacturing gray iron castings paid for themselves in 16 months by reducing total power costs 8 per cent. With a plant load consisting mainly of 220-volt, 3-phase induction motors driving air compressors, tumbling mills and other foundry equipment, power factor was so low (around 67 per cent) that an increase of conductor sizes an two feeder circuits appeared necessary. Load factor was about 70 per cent of connected load. A total of 600 kilo-volt-amperes of dust tight capacitors was connected in the system with the result that the power factor was increased to 97 per cent average, current on the two overloaded feeders diminished 200 amperes, and feeder current carrying capacity is now adequate throughout the plant.

* * *

The problem of adding iron to aluminum bronze can be solved by using an alloy containing 90 per cent aluminum and 10 per cent iron. It not only insures uniform iron distribution, but eliminates the work of introducing the iron in the form of rolled sheet or clippings.

* * *

In cast aluminum-silicon and aluminum-magnesium alloys where minimum iron pick up must be maintained to preserve mechanical properties and resistance to corrosion, it is advisable to melt the alloys in graphite or various vitreous and refractory pots.

* * *

TENDENCY of any casting to warp or crack due to internal stresses is governed by variation in cooling rate, composition of the alloy, and strength and temperature of the section at the time of stress application. Variation in rate of cooling is the most important factor since it determines to a large extent the amount of internal stress developed and the temperature at which the stress is applied to any given section.

* * *

In the case of copper-base alloy castings which are to be plated, it is pointed out that many are rejected due to surface porosity. Such porosity may be attributed to wet sand, slag inclusions, or gas absorption resulting from too high pouring temperatures and improper furnace atmospheres. Lack of permeability of sand, and improper venting also may be contributing factors. Therefore, careful study is required to find the exact cause.

PREVENTS REPETITION OF ERRORS

TO INSURE uniform practice in making castings where the interval between orders may be considerable, an Eastern foundry, use the *Foundry Experience Card* shown back and front in Figs. 1 and 2 respectively. This is not merely an additional set of reference cards. These cards form the base and integral part of the foundry office system.

Recurrence of once solved problems represents costly rejection of castings and consequent delay in attaining the proper production stride. The forgotten solution may have been the result of extensive experimentation with gates, chills, core compounds, sands, iron or any combination of the almost infinite list of foundry variables.

The customer has the right to expect that his requirements or complaints once have been met and satisfied, subsequent orders, a month, 6 months or a year later will be filled without a repetition of difficulties. He will not be satisfied with the excuse that the molder, who previously made the castings, no longer is on the job, or that such a long time has intervened that former practice has been overlooked.

The present method systematically records difficulties encountered and automatically calls the attention of the foreman to the methods which had proved satisfactory in their solution.

For Every Pattern

The pattern equipment and practice record card, Fig. 1, is made out for every new pattern received with an order. The upper part of the face is allocated to the type and number of parts of the pattern and coreboxes. If the pattern equipment is to remain at the foundry after the order is filled, it is assigned a space in the pattern storage and the exact location is indicated. Piece rates of core making, molding and cleaning are recorded on the lower face of the card. Dates on which the coreboxes and pattern are received and returned are noted above on the reverse side of the card Fig. 2. Special instructions are entered.

After studying new pattern equipment, the superintendent fills in any unusual instructions he may deem necessary for the molder. If unforeseen difficulties arise, as castings are made, solutions are suggested and tried. A slight deviation from standard practice may be sufficient, or, various intricate expedients may be necessary to obtain sound castings which meet all the customer's requirements.

Any departure from standard practice which is not obvious when looking over the equipment and which cannot be rectified permanently by changes in the set gates or patterns or coreboxes, should be reviewed with each succeeding

(*Concluded on page 92*)

New York City

TO THE 45th

For the first time in thirty-six years New York City and the Metropolitan area will be hosts to the Annual Convention of the American Foundrymen's Association. It is quite fitting that this important foundry center be accorded this opportunity, and visitors to the 45th A. F. A. Convention are assured of an outstanding program of technical sessions, plant visitation and social affairs.

The great Hotel Pennsylvania, one of Statler's finest, and one of the world's largest, will be Headquarters. The facilities of this "Hotel City" will be entirely devoted to the accommodation of visiting foundrymen, so mark the dates, May 12 to 15 inclusive, on your calendar now and make your reservations early.

HOTEL PENNSYLVANIA

A. F. A.

HEADQUARTERS

NEW YORK CITY...

MAY PRE-CONVENTION ISSUE

THE

PENTON

will be Host . . .

NNUAL A.F.A. CONVENTION

"THE FOUNDRY" ANNOUNCES ITS 1941 CONVENTION ISSUES:

As usual The FOUNDRY will present the complete story of the convention, featuring a preview of the convention with a complete program in its May, 1941 issue, and a comprehensive report of the convention itself in its June, 1941 issue.

MAY PRE-CONVENTION ISSUE

Placed in the hands of thousands of foundrymen readers well in advance of the opening of the convention, this issue will carry a complete preview of the occasion . . . the program of meetings, technical sessions and plant visitations . . . outline of social functions . . . New York as a foundry center . . . places to see . . . things to do . . . all in *addition* to the many interesting features of any issue of The FOUNDRY.

The foundry supplier and the manufacturer of foundry equipment should recognize the exceptional opportunity afforded by the Pre-Convention issue of The FOUNDRY to present a special message to their many customers and prospective customers at a time when they are gathered in friendly contact at the convention and when the attention of the entire industry is focused upon that event.

JUNE POST-CONVENTION ISSUE

A detailed story of the convention, reports on technical papers presented, news of what happened, the plants inspected and in other words, an accurate printed record of the 1941 convention meetings plus *all* the features of any regular issue of The FOUNDRY. These combine to make the June issue of unusual interest to readers everywhere.

For those who go to New York, this issue will serve as a constant reminder of a pleasant and profitable contact with their fellow foundrymen. For those who cannot attend it will be the convention itself! For *all* it will be a permanent printed record of the 45th Annual Convention of American foundrymen, insuring advertisers maximum attention to the advertising pages. Many orders will be placed and many others materially influenced by contacts at the convention and advertisements in this important issue.

AY 12-15, 1941 . . COME! — LEARN! — PROFIT!

FOUNDRY

BUILDING • CLEVELAND

JUNE POST-CONVENTION ISSUE

(*Concluded from page* 89)

order. It is the foreman's duty to state briefly on this card all precautions found necessary to insure acceptable castings.

With each succeeding order the foundry clerk takes the foundry equipment and practice record card from the file to get the equipment from the storage. From the same card he makes out the molder's order tag Fig. 3. The back of this tag is used for record of molds made each day. He also makes the office copy which has a form on the reverse side for the daily inspection report.

The foundry experience cards do not add any new files or additional red tape, but rather tend to unify all necessary data on one card. Since this card necessarily is consulted to locate the pattern, it always is present to remind the superintendent, and through him the foreman and molder, of the special instructions on the reverse side. When a new order is received, the foreman may use his discretion as to whether or not the record should be referred to, before the pattern is placed in storage. Instruction on the card shown in Fig. 2 is typical and indicates the manner in which potential or actual defects were prevented.

Industrial Hygiene Surveys Have Many Benefits

By JOHN F. McMAHON
Air Hygiene Foundation, Pittsburgh

AN INDUSTRIAL hygiene survey is to a plant what a periodic physical examination is to an individual. Such surveys disclose presence or absence of potential hazards to the health of workmen. Further, if hazards are disclosed, a competent industrial hygiene engineer can suggest remedies for their correction, such as the installation of adequate exhaust equipment. A survey of this kind is simply an inventory of factory health. Maintenance of men certainly is more important than maintenance of machines. But how can occupational health be maintained without an occasional check-up on the healthful aspects of working conditions?

Other important considerations are involved. Andrew W. Fletcher, vice president, St. Joseph Lead Co., and vice chairman of Air Hygiene foundation, makes this observation: "I strongly urge that progressive companies currently obtain information as to dust, fumes, etc., under prevailing working conditions." Mr. Fletcher further points out that courts and compensation commissions often disregard "the data obtained by experts after cases have been filed, when it is necessary to prove that conditions then found were the same as those prevailing before or at the time of the alleged accident."

Dr. H. B. Meller, managing director, Air Hygiene foundation, recently asked several foundation members the following question: "If claims for damages due to airborne dusts, fumes, vapors, mists or gases were filed against you tomorrow, do you have dependable evidence to show to what concentrations your employes had been exposed? Have you had a complete survey made of all operations where there is a potential hazard? Have such operations been made 'safe' for workers?"

But the legal consideration is only one of the reasons for considering the subject. It has been shown, and in terms of convincing cost figures, that proper attention to industrial hygiene is a very good way of making money. Some companies have obtained lower insurance rates after making industrial hygiene surveys and following through if corrective measures were needed.

A top executive of a large firm in the metal industry has this to say: "Although I cannot subscribe to the theory that all dusts are hazardous until proved harmless, I know that working in dust is unpleasant, even if it is not injurious, and I am convinced that with just a little thought, and a comparatively small expenditure of money, the amount of dust can be enormously reduced. The easiest way to reduce dust is to take dust samples of representative operations at fixed intervals of time, even if only once a month, place the results on a chart and send it to the main office of the company. This procedure, which costs practically nothing, will result in some executive giving the matter of lessening the dust a little thought."

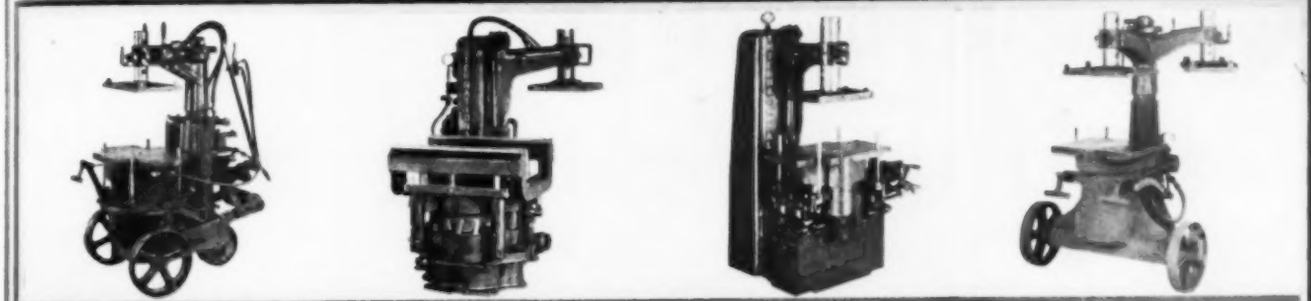
A company that does not know its hazards, or does not know positively that its operations are free from health hazards, is like a company that does not know its costs.

Taking a dust count in a foundry during shaking out

Firm To Continue

John M. Glass Co., Indianapolis, which was founded by the late John M. Glass, will be continued under the management of Thomas P. Wolfla, Willard C. Flynn and Marie M. Glass. The company is a representative of the Werner G. Smith Co. in the Indiana territory.

Woodward Iron Co., Woodward, Ala., is installing air conditioning equipment on its third blast furnace.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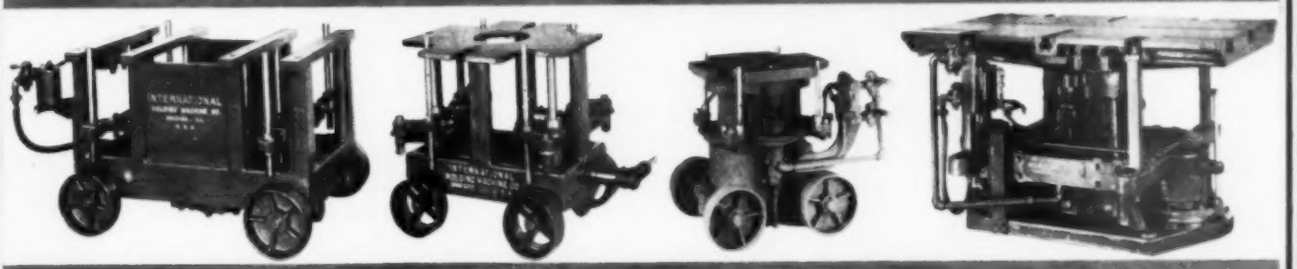
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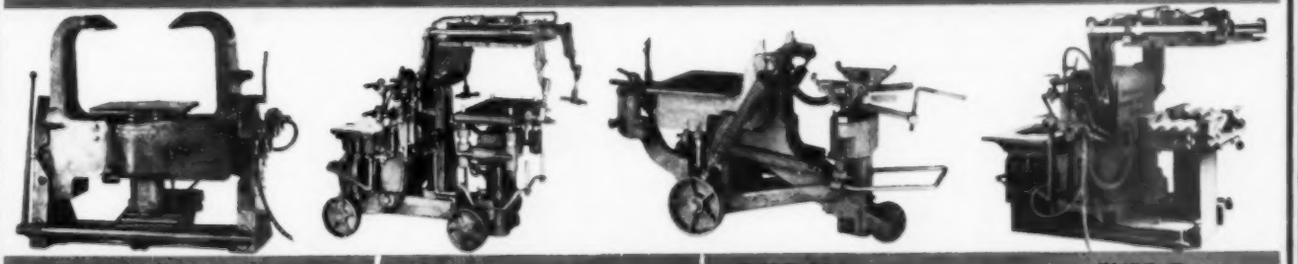
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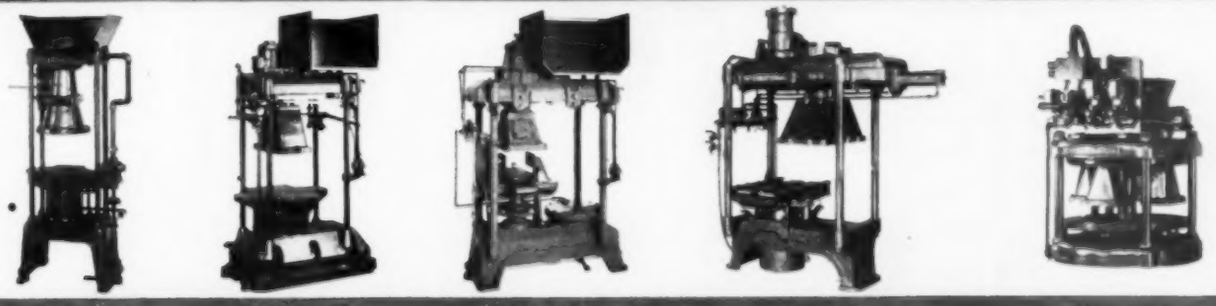
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DETROIT AMONG FOUNDRIES

By A. H. ALLEN
Detroit Editor, The Foundry

IF YOU cannot buy something, then build a plant and make it —a characteristic attitude of the Ford Motor Co. over the years—is re-echoed in the new $800,000 magnesium foundry the company now is erecting at its River Rouge works. Being incorporated in the present foundry building at the Rouge plant, itself one of the largest production iron and steel foundries in the motor industry, the new light metal casting division will be one of the largest of its type in the world, with rated output of about 110,000 pounds of castings a month.

Construction schedules call for the foundry to be in readiness for operation early next month. It will turn out castings for use in the airplane engine plant Ford is erecting at the Rouge to build Pratt & Whitney aircraft engines for the army, a $21,000,000 project slated to be completed late in March.

Facilities Below Requirements

Present magnesium foundry facilities of the nation are far below requirements of the aircraft building program laid out by the national defense advisory commission, so with typical flourish Ford decided to build his own foundry, and to build it large enough so that there will be capacity in excess of the company's needs for its own airplane engine plant, calculated to be roughly 80,000 pounds a month.

The foundry installation will embrace about 100,000 square feet on two floors at the southwest corner of the present 17-acre foundry building. The first floor will include the section where sand cores are made, final inspection division, shipping department, laboratory and office. After cores are finished and baked they will be delivered to the second floor where a system of four continuous-type conveyors will carry molds and cores to pouring stations opposite gas-fired melting furnaces. Molding machines, it is understood, will be on the second floor.

This technique is patterned after that used in the ferrous foundry, the theory being that it is more efficient to bring the molds to the metal than to bring the metal to the molds.

Nineteen furnaces with combined capacity of 500,000 pounds per month will handle melting and refining of the magnesium metal. Four of the furnaces are of 2000-pound capacity, four of 400-pound and seven of 200-pound. Four more 100-pound units will serve as refiners.

After the castings are poured and removed from molds, gates and risers will be trimmed off and the castings given a primary cleaning preliminary to heat treating. Two vertical annealing furnaces, equipped with conveyors and special fixtures to hold the castings, will be installed. Castings must be annealed at closely controlled temperatures for approximately 40 hours, part of the time in an atmosphere of sulphur dioxide gas evidently to prevent any possibility of oxidation taking place.

A special laboratory will be built in the new foundry to permit close control and inspection over all phases of the foundry operation. For example, laboratory technicians will make chemical and physical tests of both raw materials and finished castings at regular intervals to insure smooth surfaces and thus eliminate as much machining as possible. This is also a safety factor, as the machining and grinding of magnesium castings is not a little hazardous if full precautions are not taken.

An elaborate inspection department will be operated, including water testing equipment for certain parts. After being tested the castings will be shipped to the nearby airplane engine plant for machining and finishing.

New sand storage bins and space for magnesium metal storage are other elements of the program, as well as new lavatories and showers, coat rooms and lunch rooms. About 350 men will be employed in the division.

Interesting experimental work now being carried out in the Ford foundry includes the casting of crankshafts for the P&W radial engine. Some metallurgists shake their heads over attempts to cast airplane engine crankshafts, maintaining that fatigue strength is bound to be below requirements in that type of engine. But Ford has never feared to explore new techniques and new materials and past successes with castings substituted for forgings might suggest that there is at least the possibility of producing a successful cast radial engine crankshaft.

Go-ahead Signal Postponed

Locally the picture on foundry participation in the defense program still is undetermined, although the next few months may see a number of projects going ahead. One foundryman here expressed the situation succinctly when he said, "If we were given orders for just a part of the hundreds of sample parts we have submitted to the army and navy, we would be snowed under with work. But so far we have received no word as to what lies in store as far as production is concerned."

Expansion program at the Pontiac Motor division foundry is being talked again. Just this summer a 25 per cent expansion was completed with installation of one additional production "unit" (melting, molding, sand handling, etc.). Now it is understood that requests for two more units will be made for a new expansion program. This would amount to about a 40 per cent enlargement.

Pontiac is supplying a large tonnage of castings for General Motors truck requirements, as well as motor car needs for a part of Olds and nearly all of Pontiac production. Explanation for the new expansion appears to be centered around additional truck castings, more Olds work, and an undisclosed phase of defense equipment manufacture.

Index Is Ready

INDEX of volume 68 of THE FOUNDRY, covering over 630 pages of editorial material published during 1940, now is available. The Readers' Service department of THE FOUNDRY will be glad to send the index free to subscribers upon request.

ATTENTION!

Among books selected for use in libraries, vocational schools, trade schools, and for government agencies who are cooperating in the training for national defense programs are four important books on foundry problems and practice. These four books, all published by Penton Publishing Company, are thoroughly practical in their treatment of foundry problems . . . all are written by well-known foundrymen *for foundrymen*.

"ELEMENTARY FOUNDRY TECHNOLOGY" . . .

This book is an excellent book of instruction for apprentices, young men studying the foundry trade and for reference use of practical foundrymen. Included, in addition to elementary chemical and physical data, are discussions of; effects of elements on iron; iron manufacture; elementary problems in steel foundry production; brass melting foundry sands, molding machines; and gates and risers. Second Edition, 377 pages, 132 illustrations, $3 postpaid.

"MODERN BLAST CLEANING AND VENTILATION" . . .

This book, by C. A. Reams, engineer of Ford Motor Co., brings latest and most approved methods of casting cleaning to foundrymen in plain language. It is full of completely practical suggestions and proved methods and practices. Application of cleaning methods discussed will eliminate many objectionable cleaning room practices. Full information on abrasive selection and use is included. Practical foundrymen report this book worth many times its cost. 213 pages, 38 illustrations, $4 postpaid.

"GATES AND RISERS FOR CASTINGS" . . .

This is a practical book covering completely and with authority a subject never before covered in book form. It is an encyclopedia of sound foundry practice supplying reliable answers to the ever present question, "How can casting defects be prevented?" Written for every foundryman from workman to owner. 373 pages, fully illustrated, $3 postpaid.

"IMPACT CLEANING" . . .

Wm. A. Rosenberger is a recognized impact-cleaning engineer who has gathered together all important information on the subject and presented it in readily understood form. Every foundryman knows that cleaning costs can eat up profits. This book shows both theoretical and practical ways to reduce cleaning costs to a minimum. It presents the "how and why" of high cleaning costs and shows exactly the methods to be used in their reduction. No foundryman responsible for either quality production or satisfactory earnings should be without this book. 480 pages, 256 illustrations, $7 postpaid.

Now, more than in any recent period, foundrymen must be "on their toes" to meet the demands of national defense . . . these books will help in solution of practical problems . . . in training of personnel . . . in short-cutting experimental programs by showing proved solutions to many typical foundry problems.

Order the books you need today . . . for convenience use the coupon . . . if there are any other subjects on which you want books, send your "want list" with your order and we will be happy to inform you of books available.

THE FOUNDRY, Book Department, 1213 West Third St., Cleveland, Ohio

Enclosed is $ ..... *☐ Check; ☐ Money Order; ☐ Company Order; for the following books I have checked. . . .

☐ "Elementary Foundry Technology", @ $3 postpaid. ☐ "Modern Blast Cleaning and Ventilation", @ $4 postpaid.

☐ "Gates and Risers for Castings", @ $3 postpaid. ☐ "Impact Cleaning", @ $7 postpaid.

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CITY: ..... STATE: .....

*Orders for delivery in Ohio must be accompanied by an additional 3% to cover compulsory state sales tax.

Comment

FREQUENTLY the editor finds that insufficient space is provided on the editorial page of this publication to pass on to readers some of the numerous items which would seem to provide ideas of particular interest to foundrymen. On such occasions in the future, and particularly as the spirit moves, this page will be utilized to present both original and borrowed material.

— □ —

THE FOLLOWING quotation is from a publicity announcement of a new squirrel cage induction motor introduced recently by the General Electric Co.: "It features modern streamlined appearance; more complete protection—through use of a cast iron frame—than previously available except in especially enclosed machines. . . . . It incorporates the cast aluminum rotor . . . ."

— □ —

SEVERAL chapters of the American Foundrymen's association are doing a splendid job in conducting lecture courses as an educational feature for the men in the district. Immediate results will be shown in many cases for the men attending these courses will be better prepared to meet the problems arising in various phases of the defense effort, as they apply to the manufacture of castings. The other night I had the pleasure of attending the first of a series being staged by one of the younger chapters. I saw a fine looking group of men, many of them youngsters just starting their industrial careers. A number were older in years of service, but all were seeking more knowledge and inspiration in the field of castings production. Through this activity, organizations are furthering the welfare of the foundry industry for many years to come.

— □ —

AS THIS was written, the National Association of Manufacturers was conducting a survey of industrial resources, which Walter D. Fuller, president of the association, said would record "factories and facilities, even to every back alley machine shop, every obscure country foundry, every hole-in-the-corner parts shop, every employer of two or three or a dozen mechanics who can perform a productive service to the program of defense . . ."

This is just another indication that much will be demanded of the foundry industry in the weeks and months ahead.

— □ —

THE DEFENSE program has provided a sounding board for a series of blasts against the gray iron foundry industry. A fine example of the latest effort in propaganda is found in the following quotations from a recent statement released for publication by James F. Lincoln, president, Lincoln Electric Co., Cleveland:

> The fundamental difficulty with the war efforts of the democratic powers at this time is the fact that the axis powers have advanced their war efforts by invention and progress in manufacturing with its application to their problems. The enormous savings in time and cost of manufacturing machinery made possible by the use of welded steel is a matter of fact, not opinion.
>
> It is easy to see where this is true. Steel is approximately five times as strong and 2½ times as stiff as standard cast iron. In many instances, this means that there is needed only from 20 to 40 per cent as many pounds of steel for a structure or machine as is necessary with cast iron. Obviously the amount of machining on the smaller quantity of material will be, in general, proportional to the amount of metal used. With half as much metal, certainly approximately half as much machining would be done.
>
> There is another saving. An ordinary gray iron casting necessarily cannot have as accurate form as would be true of rolled steel. Therefore, the amount of surface which must be removed in machining is cut down by the accurate use of steel. Thousands of instances in which welded steel has been used illustrate and substantiate these statements.
>
> It would seem a tragedy, after what has happened to France, Belgium, Holland and Norway to continue, like frightened ostriches, to hide our heads in the sand. If Hitler can take advantage of invention, certainly this country can. We must not be held back by conservatism, fear or the desire to remain comfortable."

Every now and then I receive copies of *Die Giesserei* which slip through the blockade and up to now that publication has failed to record that Hitler has abolished those great foundries in Germany and the conquered countries.

And I would enjoy having a definition of *standard cast iron and ordinary cast iron.*

— □ —

THE DECEMBER issue of *Metal Progress* carried the following interesting comment by its editor, Ernest E. Thum:

> Contemplating the possibility that the ordnance department has gone from the one bottleneck of high grade steel castings to the other bottleneck of high grade alloy steel weldings. After the World war all field artillery was remodeled to decrease weight and increase mobility and power. Unfortunately, governmental rules for purchasing on the price basis tended to exclude really high grade steel castings, and the ones procurable were not good enough. So gun mounts were redesigned of low alloy, high strength steel weldings and enough work done at Watertown arsenal and elsewhere to indicate that the designs were adequate and weldable. Ordnance officials now seem sure that there will be no difficulty in getting these mounts in sufficient quantity, but one may wonder whether there is not a disturbing parallel: During the depression of the early 1930's, there was little or no business, and energetic staffs figured out a lot of new and more economical manufacturing methods that looked fine on paper but often developed unforeseen and serious difficulties in 1937 when there was some production to try them out on. Similarly the ordnance department for 20 years has had no war business and in that time has planned many improvements; now when business is coming back in a big way it is too much to expect that production will flow forth without a hitch here and a tie-up there. Would it not therefore be the course of wisdom to use the lightest weight steel weldings for fast motorized artillery, but go back to slightly heavier steel castings for mounts of guns like, say, antiaircraft which will be required in great numbers to guard industrial centers, and which need be moved only if spotted?"

F. G. S.

Foundry Activities

ALUMINUM INDUSTRIES INC., Cincinnati, has awarded contracts to the Austin Co., Cleveland, for the construction of a 130,000-square foot foundry and paint shop. The plant will be erected on a new 27-acre site on Werk road, Cincinnati. The structure and building equipment will represent an investment of approximately $400,000 and will supplement the company's existing facilities in Cincinnati. The new plant will be devoted entirely to the production of magnesium and aluminum castings for aviation, automotive and other basic defense industries.

* * *

Concord Foundries Ltd., Grimsby, Ont., is erecting a foundry to cost $40,000 with equipment.

* * *

American Steel Foundries Co., 1001 East Broadway, Alliance, O., is erecting a storage building covering 7500 square feet.

* * *

Akron Brass Mfg. Co., Wooster, O., is building a one-story addition to house factory and office. Cost, $40,000.

* * *

Aluminum Co. of America, 5151 Magnolia avenue, Los Angeles, is constructing an addition to its plant to cost approximately $129,000.

* * *

Empire Brass Mfg. Co. Ltd., Dundas street East, London, Ont., is constructing a 2-story plant addition 65 x 87 feet.

* * *

Nutmeg Crucible Steel Co., Branford, Conn., is building a 1-story foundry addition 70 x 130 feet, to cost approximately $40,000.

* * *

Peerless Aluminum Castings Co., Bridgeport, Conn., is building a 1-story plant 50 x 152 feet estimated to cost about $40,000.

* * *

Western Steel Casting Co., 145 Horton street, Seattle, Wash., is building a foundry extension 20 x 70 feet.

* * *

Chicago Foundry Co., 2028 North Major avenue, Chicago, manufacturer of light gray iron castings, is constructing a 1-story, 17 x 100 foot addition to its foundry.

* * *

California Brass Mfg. Co., 1447 Naud street, Los Angeles, is erecting an addition to its brass foundry 50 x 25 feet, to cost approximately $1000. The concern is headed by L. R. Raymond.

* * *

G & C Foundry Co., West Monroe street, Sandusky, O., is building a 1-story addition 24 x 54 feet, to enlarge facilities. John E. Carroll is president.

* * *

Light Alloys Mfg. Co., 301 Richmond street, Painesville, O., has acquired a 5½ acre site for a new foundry building. Amos Walton is president of the company.

* * *

Miller's S. & S. Foundry, 3307 East Pico boulevard, Los Angeles, is the firm name under which William Steele Miller has obtained a certificate to conduct business.

* * *

Hamilton Foundry & Machine Co., Hamilton, O., is celebrating its golden jubilee year, having been founded in 1891. The plant consists of four individual foundry units, 4¼ acres under one roof with 18 acres of yard area. Peter E. Rentschler is president.

* * *

Los Angeles Shipbuilding & Drydock Co., San Pedro, Calif. has announced that there will be a brass foundry, iron foundry, machine shop, optical department and many other facilities for the maintenance of the battle fleet in a 9100-ton repair ship to be built for the United States navy by that company.

* * *

R. G. Haskins Co., 615 South California avenue, Chicago, is building an addition to its plant which will provide approximately 8000 square feet of additional manufacturing space.

* * *

Index of sales of foundry equipment during November, according to the Foundry Equipment Manufacturers association, Cleveland, is 254.2 as compared with 264.0 in October.

* * *

North Shore Foundry Co., Eleventh street and Greenfield avenue, Waukegan, Ill., is building a $4000 addition to its foundry. The company produces gray iron castings.

* * *

Martinolist Shipbuilding Co., San Diego, Calif., has been issued a building permit for construction of a new foundry building at the foot of Twenty-eighth street. The new corrugated iron shop will cost approximately $2500.

* * *

Calumet Pattern Works, 10604 South Buffalo avenue, Chicago, is constructing a one-story brick building, 100 x 75 feet, which will double its present capacity. When the new building is completed, the company will move all present equipment into it. The expansion program will cost about $20,000.

* * *

Production Mold & Machine Co., manufacturer of permanent mold and permanent mold aluminum castings, has opened a plant at 8507 Park lane, in Firestone park, Los Angeles, under the management of Thomas B. Wilde, mechanical engineer. The foundry is used for the production of castings and for the testing of molds which are supplied for other foundries.

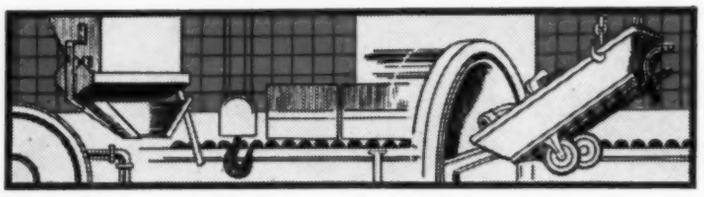
* * *

Ampco Metal, Inc., 1745 South Thirty-eighth street, Milwaukee, plans the construction of a new centrifugal casting building, doubling the size of that division, and it is claimed, making the foundry of that organization the largest bronze casting plant in the middle west. The company also is completing a 2-story addition comprising locker rooms, shower baths and similar facilities together with storage space.

RAW MATERIAL PRICES
Jan. 15, 1941

Iron	
No. 2 foundry, Valley	$24.50
No. 2 Southern Birmingham	20.00
No. 2 foundry, Chicago	24.00
No. 2 foundry, Buffalo	24.00
Basic, Buffalo	23.00
Basic, Valley	24.50
Malleable, Chicago	24.00
Malleable, Buffalo	24.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$6.00 to $6.60
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	11.50
Scrap	
Heavy melting steel, Valley, No. 2	$21.00 to $21.50
Heavy melting steel, Pittsburgh, No. 2	20.50 to 21.00
Heavy melting steel, Chicago, Auto No. 2	16.50 to 17.00
Stove plate, Buffalo	16.50 to 17.00
Stove plate, Chicago	14.00 to 14.50
No. 1 cast, mchy., New York	19.00 to 19.50
No. 1 cast, mchy., Chicago	19.50 to 20.00
No. 1 cast, Pittsburgh	21.50 to 22.00
No. 1 cast, Eastern Pa.	24.00 to 24.50
No. 1 cast, Birmingham	18.00
Car wheels, iron, Pittsburgh	21.50 to 22.00
Car wheels, iron, Chicago	21.50 to 22.00
Railroad malleable, Chicago	24.50 to 25.00
Malleable, Buffalo	23.00 to 23.50
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	12.12½
Straits tin	50.10
Aluminum, 99 per cent	17.00
Aluminum, No. 12 (Secondary, standard)	16.50 to 17.00
Lead, New York	5.50
Antimony, New York	14.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	7.25

NEW EQUIPMENT . . .



AND SUPPLIES

Pressure Gage

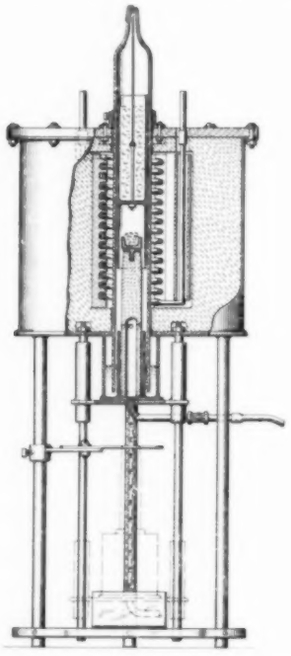
Donald J. Reese, 638 Scotch Plains avenue, Westfield, N. J., recently has placed on the market a new and improved type of gage for reading the blast pressure on cupolas. The device, shown in the accompanying illustration is a diaphragm gage 2½

inches in diameter, 19/16 inches thick, weight 11 ounces and claimed to be accurate within 2 per cent. It has no varying zero point and is readable in fractions of an ounce up to 36 ounces. It is designed primarily for a referee gage with a bottom hose connection, but also is available with a threaded connection for permanent installation. The gage was designed originally for the benefit of investigators and cupola experts who wanted a gage that did not operate on mercury, oil or water, something that would not go out of service if the glass was broken, and small enough to carry in pocket or brief case.

Combustion Furnace

Hevi Duty Electric Furnace Co., Milwaukee, has placed on the market a new vertical type combustion furnace for determination of carbon in steel, malleable iron and cast iron, which is claimed to possess several unique features. As shown in the accompanying cross sectional view the heating element is a helical coil supported in strips of grooved refractory and is surrounded by insulating material which in turn is enclosed in a steel shell. The furnace may be operated continuously at 2300 degrees Fahr. although 2050 degrees has been found to be a satisfactory operating temperature.

Combustion tube is sillimanite of standard stock size 1¾ inches inside diameter, ⅛-inch wall, 20 to 24 inches long with tapered end for rubber hose connection. Sample in clay crucible is carried on a pedestal with nonoxidizing cap which is raised into and lowered from the



furnace. Platform of pedestal elevator has an annular trough holding a low melting point alloy for sealing the bottom end of the combustion tube. A protecting sleeve suspended inside the tube prevents spattering the combustion tube. Instead of the customary, elongated type combustion boat, hand-made crucibles of common fireclay with 20 per cent silica sand may be utilized. While designed primarily for carbon determination the furnace is adaptable for other uses such as sulphur determination with properly selected absorption train, and heat treatment of small delicate parts in a protective atmosphere.

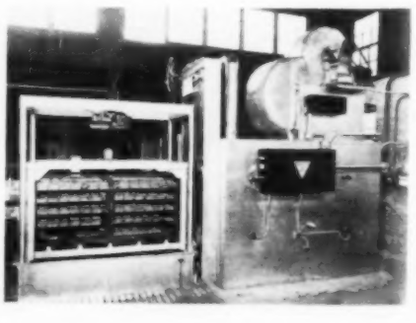
Prevents Spatter

Universal Power Corp., Cleveland, is marketing a product for prevention of weld spatter. The material is claimed to prevent adhesion of weld rod spatter to the work, cutting down cleaning time as much as 50 to 75 per cent. It is in liquid form and may be brushed or sprayed on the work. The material also serves as a rust inhibitor and a base for paints and lacquqers. The firm also is distributing a water soluble, easily removed material to prevent weld spatter from adhering to welded parts adjacent to the weld. The material is recommended for use where welded work is to be galvanized or left unpainted as in the case of stainless steel, aluminum, monel metal, copper, and other varieties of metal.

Heat Treatment

Despatch Oven Co., Minneapolis, has developed a new furnace for heat treatment of aluminum and magnesium alloys, which is claimed to give increased physical properties and reduced processing cycle. The unit is made in various sizes, and the one shown in the accompanying illustration has an inside working dimension of 4 x 4 x 8 feet. It is heated by a 100 kilowatt open coil heating system. Heated air at a temperature of 960 degrees Fahr. controlled to plus or minus 5 degrees, is circulated through the furnace at velocities from 17 to 20 miles per hour with an oversize fan.

Four thermocouples in each side



wall connected to a multiple selector switch permit determination of the temperature at those points. On preheating of load and furnace the full 100 kilowatts are required for the first two hours after which consumption tapers off to approximately 25 or 30 kilowatts per hour. The furnace also may be equipped with gas heating to meet individual requirements. The quench tank and elevator system adjoining the furnace are of the firm's own design and permit rapid quenching in 18 to 20 seconds. The furnace is claimed to reduce the processing time 2 to 3 hours.

Air Gun

Air-Way Pump & Equipment Co., 569 West Van Buren street, Chicago has developed an air valve or air gun with hardened steel nozzle for blowing service where service conditions are severe. Valve design requires no packing gland and no external levers or buttons. An actuating lever connected to the valve by a ball and socket joint extends into the hose. Flexing the hose slightly through thumb and fingers deflects the lever and opens the valve. When the hose is released the valve closes instantly with a leak proof seal.

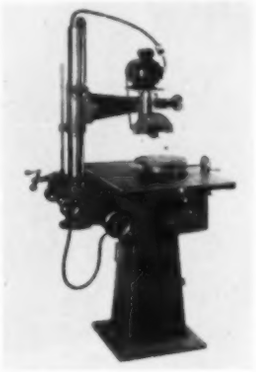
Dust Exhausters

Standard Electrical Tool Co., Cincinnati, recently has made available three sizes of exhauster equipment for the protection of operators and equipment against dust, grit, etc. arising from grinding, buffing and polishing operations. As shown in the accompanying illustration, the unit comprises a motor driven exhauster with air filtering stand. The grit and dust is arrested by mineral

wool pads in the filtering unit, and the air exhausted without perceptible dust escaping. The unit may be attached to any equipment containing wheels up to 24 inches in diameter.

Pattern Machine

Crescent Machine Co., Leetonia, O., has introduced a multiform machine designed particularly for the use of patternmakers and to take the place of large, heavy milling machines. The machine, shown in the accompanying illustration, is offered in either bench or floor models and carries a cutter head arbor which it is claimed is practically universal in adjustment. The cutter arbor yoke mounted on a crosshead may be adjusted vertically, horizontally, at any angle or rotated on the cross head or in any combination of these movements. The table is provided with various



fixtures and a hand operated screw feed. Centers for cutting threads and twisted moldings also are provided. The arbor is driven by a V belt from a variable speed pulley on a ½-horsepower ball bearing motor. The arbor speed easily is varied to suit the cutter diameter. Complete set of round nose, fly, router and other cutters as well as grinding fixtures accompany each machine. It is claimed this versatile machine performs a wide range of complex operations with great speed and accuracy, is priced at an attractive figure and is a valuable adjunct to any patternshop.

Electric Motor

General Electric Co., Schenectady, N. Y., has introduced a line of new polyphase induction motors. In all ratings the new motor features modern streamline appearance; more complete protection through the use of a cast iron frame; major advances in the insulation of current carrying parts; improved bearing design and lubricating arrangements, cast aluminum rotor, pressure relief system of greasing and many other new convenience features. End shields are designed to match the frame and are enclosed above the center line. Improved air deflectors and fan design in addition to double end ventilation con-

tribute materially to lower temperatures.

Cool air is drawn from both ends and immediately impinges on the coil extensions. The complete sleeve bearing utilizes hard tin babbitt centrifugally cast into a steel shell. A new and wider conduit box with unusually wide working space simplifies installation. The box may be mounted in any one of four positions. Clearly marked terminals identify the leads. The stator is reversible. Ball bearing motors can be operated vertically or horizontally. End shields easily can be changed to any one of the four positions. The oil filler gage can be located on either side. In the larger sizes a drain plug permits draining of the bearing housing without tilting the motor.

Lift Truck

Barrett-Cravens Co., 3250 West 30th street, Chicago, has developed a new lift truck, which has a carrying capacity of 2500 pounds. The full lift of 3 inches is accomplished through 13 short or four full strokes. Front wheels are wide spread for stability and all four wheels are mounted in ball bearings. The truck body is made in sizes ranging from 30 to 144 inches, in multiples of 6 inches; widths from 18 to 24 inches and mounted on wheels 6, 7, 9 or 11 inches diameter. A second model is built to the same general specifications, but has a lifting capacity of 3500 pounds. Both types have angle lift and spring handle hold up.

Magnifying Lens

Boyer-Campbell Co., 6540 Antoine street, Detroit, has introduced a magnifying lens and light for industrial first aid stations and hospital use. The unit, shown in the accompanying illustration, may be moved about on a completely adjustable bracket and remains in any desired position. It is equipped with a mounting clamp and may be at-

tached to a chair or table. The magnifying lens and light assist the operator engaged in removing foreign bodies from the eyes, splinters

from the fingers or elsewhere, for drilling surgery, suturing, puncture wounds, eye treatment, etc. It is claimed the same unit of powerful magnifying lens and properly directed light is available on suitable brackets and in neutral colors for use in the shop, for close inspection and precision work on universal tool and cutter grinders, millers, shapers, lathes, etc.

Sand Sampler

Harry W. Dietert Co., 9330 Roselawn avenue, Detroit, has developed the molding sand sampler, shown in the accompanying illustration, which makes it easy to secure a sample of molding sand from the interior of a heap or bin. In use the sampler is inserted into the sand, and the sand pushes through the tapered container. That is said to insure that the sand in the sampler is representative of the section of sand to the depth inserted. When the sampler is pulled from the sand, the tapered container grips

the sand. A 700-gram sample is removed with each sampling. Sampler is constructed sturdily. Handle is cast aluminum with a steel shaft 24 inches long. Tapered sand container is pressed brass.

Goggles

American Optical Co., Southbridge, Mass., has developed a cover glass goggle for protection to gas welders who must wear glass for correction of vision. The new goggle fits snugly over any style spectacle and protects the eyes from flying sparks and scale, light rays and glare. Other features include improved ventilation louvers that keep eyes cool and lenses clear, yet exclude light; and especially shaped eye cups, durable composition, strong and moisture proof, nonconductors of heat and electricity.

Respirator

Willson Products, Inc., Reading, Pa., has developed a light weight respirator claimed to be so light in weight and so easy to breathe through that it can be worn for long periods of time without caus-

ing any noticeable discomfort or slowing down of the worker. From head band to exhaust valve it is a completely rugged assembly. Rubber face pieces cannot be crushed out of shape. Screw type filter assembly cannot be put together wrong or bent out of adjustment. To clean and sterilize, the long life filter is removed and the respirator is washed in soap and water or a disinfecting solution.

Arbor Saw

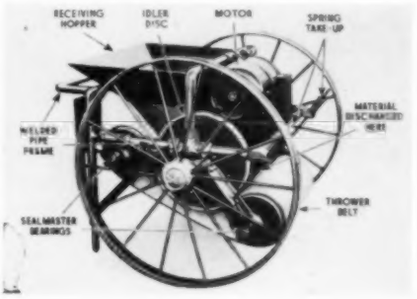
Yates-American Machine Co., Beloit, Wis., has introduced a new tilting arbor circular saw with standard one piece table 32 x 36 inches, cut off capacity of 17 inches ahead of the saw and 25 inches with front table extensions. The saw will rip to the center of 38-inch stock and to the center of 50-inch stock with side extensions. The machine handles stock up to ¾-inch thickness. Hoist and tilt screws have a heavy acme thread and no gears. A pin type arbor lock enables the operator to lock the arbor when changing saw blades.

The table is heat treated cast iron, heavily ribbed, ground and polished on the working face and provided with two miter gage slots one on either side of the saw. The double

face rip fence slides on a bar mounted clear of the table. The miter gage has a plane type handle for safety, has taper pin stops at 15 degree intervals and swings 60 degrees right and left. Kick back fingers are on both sides of the splitter. A micrometer adjustment on the rigid rip fence is mounted on a legible direct reading scale. The ¾-inch arbor is driven by three *V* belts from a motor runing at 3000 revolutions per minute.

Loader and Piler

Stephens-Adamson Mfg. Co., Aurora, Ill., has made several changes in the construction of the loader and piler, shown in the accompanying illustration. All loaders now are equipped with permanently sealed, self aligning, prelubricated ball bearing units. It is claimed that this feature results in a minimum of maintenance attention and maximum power saving in the dusty conditions under which these machines normally operate while loading bulk materials into cars or into piles. To facilitate adjustment of the fast moving dished belt a screw control extends from the bearing through the front of the frame. To move the bearing backward or forward it is only necessary to turn this control right or left with an ordinary wrench. The pipe frame has been redesigned.



Booth Fan

American Machine & Metals, Inc., East Moline, Ill., through its DeBothezat Ventilating equipment division recently has placed on the market a new paint spray booth fan. It is claimed the fan assures required protection against hazards of spray painting under all operating conditions. Built to underwriter's specifications, the fan is corrosion resistant and nonsparking. The motor is mounted substantially and balanced outside the fan housings on an adjustable base. Power is transmitted through *V*-belts in a vapor proof chamber. Fan wheels are die cast aluminum. Blades are easily removed for cleaning. The fan is available in standard sizes from 18 to 42 inches diameter.

Solenoid Valve

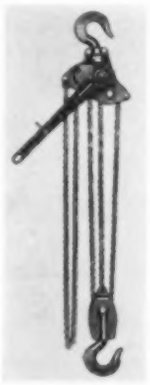
General Electric Co., Schenectady, N. Y., recently has introduced a new, inexpensive solenoid valve for general applications in the control of air, oil, water and gas as well as requirements of the heating and air conditioning industry. It may be used as an oil shutoff for oil burner service, pilot-gas control for gas burners, air control for compressed air devices, etc. Since it is designed to be incorporated into an assembly that has its own enclosure, no coil cover, conduit plate, etc. have been provided.

Protection Hood

Industrial Products Co., 800 West Somerset street, Philadelphia, has developed a new protector hood which it is claimed offers complete protection to the head, face and neck from splashes and sprays of acid, oil, alkali and other foreign substances. A strong, light aluminum frame contains a replaceable front of transparent acetate 5 x 9 inches offering full vision in all directions. The frame is supported by special fiber head gear quickly adjustable to all head sizes. Cape is full cut so that mask may be thrown up over the head when the wearer is not exposed to certain hazards.

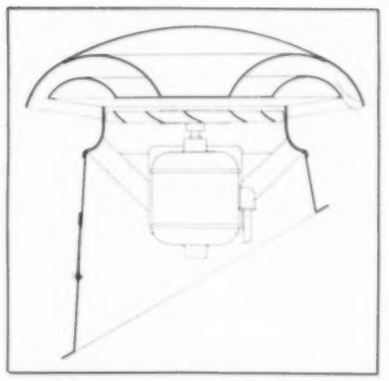
Portable Hoist

A new addition has been made to the line of pull-lift type, portable hoists made by the Philadelphia division, Yale & Towne Mfg. Co., Philadelphia. The hoist, which is shown in the accompanying illustration, has a capacity of 4½ tons, and is claimed to be strong and light in weight. Roller chain has an ultimate strength of nearly five times the hoist capacity. The hoist will operate equally well in horizontal or vertical position so that it may be used for pulling or lifting. The hooks are of the safety type which open slowly under severe overloads without fracture, giving ample visual warning. For operation in close quarters the hoist has a ratchet handle with a universal action. Possibility of flying handle is decreased to a minimum by a self actuated brake which increases brake pressure with increase of load.



Ventilator

DeBothezat Ventilating Equipment division American Machine & Metals, Inc., East Moline, Ill., has introduced a new power roof ventilator which is claimed to provide positive ventilation at all times irrespective of weather conditions. The new unit offers a large volume of air per horsepower while maintaining low tip speeds which results in quieter operation and increased efficiency. Special aerodynamical design of fan blades assures uniform velocity of air over the working face of the fan blades and makes them exceptionally efficient against pressure. Non-overloading characteristics protect against burned out motors. Entrance eddy losses are reduced to a minimum by a new entrance ring.



Ventilators, according to statements issued by the manufacturer of the device, are available in a wide range of sizes and capacities.

Welding Rod

American Manganese Steel division, American Brake Shoe & Foundry Co., Chicago Heights, Ill., has introduced a manganese-molybdenum steel welding rod for building up worn high manganese, carbon steel, and gray iron castings. It is available in 18-inch lengths in the bare form for straight direct current welding, and in combination coated form for both direct current and alternating applications. The manganese-molybdenum rod does not replace nickel-manganese rod intended for high tensile strength and shock resistance, but is recommended for straight build-up welding on a wide general run of work.

Disk Sander

Skilsaw Inc., 5033 Elston avenue., Chicago, has introduced three new sanders. One is a heavy duty, two speed sander and polisher especially developed for steady use. Maximum efficiency from a 7-inch disk is obtained when the machine is running at 4200 revolutions per minute. Changed to 1300 revolutions per minute the tool is used for fine polishing. Speed is changed through a simple gear shift. Economy is claimed for a second two speed heavy duty sander where a 9-inch disk is used first at a speed of 2700 revolutions per minute. When worn the disk is cut with a special disk trimmer to 7 inches diameter and run at a speed of 4200 revolutions. A third machine is an extra heavy power unit for sanding, grinding and surfacing operations. It operates at a no load speed of 5000 revolutions per minute, speed recommended by grinding wheel manufacturers as the most practical for 6-inch wheels. Attachments include sanding pads, grinding wheels, wire cup brushes and other accessories.

Industrial Scale

Exact Weight Scale Co., 944 West Fifth avenue, Columbus, O., has introduced a new production and checking scale built in two popular sizes, one with weighing capacity of 100 pounds; the other with a capacity of 150 pounds. Special features include: Low weighing platform 6½ inches from floor; open construction to permit easy cleaning; tower inclined at 30 degrees and revolving to face any direction; dial 16 ounces over and under; ⅛-inch indicator travel for each ounce; exceptional speed due to very low platter fall; portable with carrying handle on each side; weighs accurately in any ordinary out of level position; aluminum alloy construction; visible sensitivity of ¼ ounce.

Photometer

General Electric Co., Schenectady, N. Y., has made available a new photometer for application to transmission measurements which is particularly valuable in quantitative spectrographic analysis for comparing densities of spectral lines. It is said to provide compactness, mechanical simplicity, ease of operation and flexibility. Arrangement of the instrument permits the operator to see a magnified portion of the exact field being measured. Several apertures are provided in the screen which may be changed easily by changing the position of the diaphragm. The slit diaphragm can be rotated to align closely the image of the spectral line with the slit aperture. After final adjustment the optical parts remain fixed and require no further movement for focusing. Spectral lines are focused on the screen by moving the plate plane with respect to the objective.

Tipper

Lewis-Shepard Sales Corp., 295 Walnut street, Watertown, Mass., has developed a new device for the safer handling of barrels and drums. This tipper combines a strong handle with an adjustable pronged collar which allows the tipper to fit all types of drums and large or small bilge barrels. It is designed to facilitate the job of tipping barrels from a horizontal to vertical position or the reverse. The long handle increases the leverage. Effort required to handle barrels or drums is much less than required for handling them in the ordinary manner without the tipper.

Eye Shield

Kimball Safety Products Co., 7314 Wade Park avenue, Cleveland, has developed a cellulose acetate side shield for use on workmen's spectacle type protective goggles. The

shield, shown in the accompanying illustration, is made from strong plastic material either clear or tinted to reduce glare. The purpose of the shield is to provide added protection against foreign particles getting into the eye from the side. It does not interfere with normal vision.

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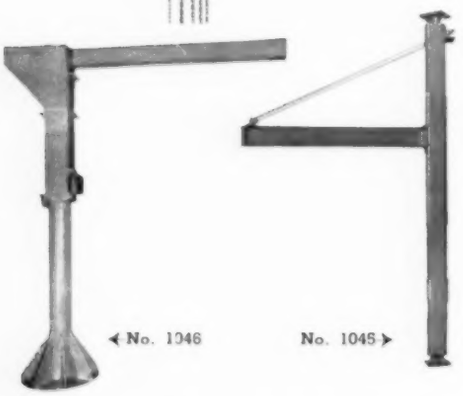

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Malleable Annealing

Is Based on Composition

By
RICHARD SCHNEIDEWIND
Associate Professor
University of Michigan
Ann Arbor, Mich.

PROCESS of annealing malleable iron has been practiced for over a century. At first everything was done as a result of trial and experience. Later, certain fundamental facts gradually discovered helped the foundryman improve his process and to save money. The theories underlying malleabilization were not studied intensively except by a few pioneers including Professor Touceda. Theories are of little value except for intellectual satisfaction unless they can be applied commercially. Sufficient knowledge was accumulated to start serious research about the time of the World war. In the past 10 years considerable attention has been directed toward foundry metallurgy with resulting benefit to the malleable field. In spite of all the laboratory tests, research, and improvements in the foundry by the foundryman himself, there is more to be learned than has been learned.

Purpose of Annealing

The purpose of annealing is to change white iron into malleable iron or to reduce all the combined carbon to the temper carbon form. The aim is to accomplish this process in the shortest possible time at minimum cost and in a manner to obtain the best physical properties in the product.

Starting point of all metallurgical discussion is the iron-carbon diagram. This diagram has been worked out satisfactorily for steel metallurgists, but is an imperfect instrument to predict the behavior of irons during solidification. A diagram for alloys containing 2 per cent silicon is more desirable for gray irons than for white but with a few minor corrections it will apply for white irons of 1 per cent silicon. This diagram shows 2.3 per cent carbon, 1 per cent silicon white iron, and a structure of massive carbides and pearlite. By applying some simple arithmetic it is possible to find out how much carbide there is to decompose. For example 100 pounds of this white iron has 33 1/3 pounds of carbides in the form of massive carbides and in the pearlite and 66 2/3 pounds of ferrite. These figures are approximate because of the presence of 2 or 3 pounds of silicon, manganese and impurities.

In the annealing process the carbide is soluble to different degrees at different temperatures and at the soaking temperature only the massive carbides remain to be transformed to temper carbon.

Where 100 pounds of white iron is heated to the soaking temperature, 13 1/3 pounds of carbides present in pearlite dissolve in the iron leaving only 20 pounds to decompose at this temperature. As the material is held at the soaking temperature, the carbide begins to decompose according to the chemical equation, $Fe_3C \rightarrow 3Fe + C$. In malleablizing the process is not quite so simple, otherwise graphite simply would replace the carbide and the material would be similar to gray iron.

Carbon Dissolves in Iron

What actually happens is that the carbide dissolves in the surrounding iron, the carbide decomposes into atoms of iron and carbon, the carbon atoms migrate or find their way toward a temper carbon seed crystal and the carbon atom deposits itself there. This process repeats itself until there is no more massive carbide and first stage annealing is complete. At this point 13 1/3 pounds of carbides, 1.3 pounds of temper carbon and the remainder iron are left in solution in the iron which cannot be decomposed.

The time necessary for this step for a given iron and temperature follows a well known chemical law, the law of mass action, which operates on the principle that every minute a certain percentage of the carbide remaining is decomposed.

Now the iron must be cooled. As it approaches the critical temperature less and less carbide can be kept in solution. It is thrown out, decomposes and builds on to the temper carbon particles. At the critical temperature there is a sharp decrease in solubility. Cooling below this temperature usually causes the carbide to be thrown out of solution faster than the laws of chemistry can seize the carbide and decompose it. This carbide forms pearlite which must be decomposed slowly in second stage annealing below the critical.

The foundryman has done one thing in his annealing cycle which scientists long overlooked. He has maintained a slow cooling rate through the critical range. In this manner carbide is thrown out of solution through the inclined part of the solubility curve only slightly faster than it could decompose leaving only a small amount of pearlite to be decomposed below the critical.

Law Works on Percentage

Consider the factors which may help speed up the whole process. Authorities have demonstrated that the more seed crystals or nuclei of temper carbon which can be formed, the faster the graphitization. This is only logical since the law works on a percentage basis. The problem becomes one of encouraging formation of nuclei.

The first is temperature of soaking. The higher the soaking temperature, the more nuclei and the faster will be the anneal. This is true for both first and second stage malleabilization. Practical consideration shows that the cost of fuel and refractories increases with temperature. There is greater danger of warping and scaling. Tests have indicated a slight decrease, 5 per cent per 100 degrees Fahr. in tensile properties.

The second factor is silicon. The reaction

$$\frac{Fe_3C}{Si} \rightarrow \frac{3Fe + C}{time}$$

works on a delicate balance between silicon and time. The or-

dinary iron-carbon diagrams will not explain this because they do not indicate what happens to the silicon. If all the silicon went into the iron constituent and came into the carbides, then the annealing time would not be influenced by silicon. Some silicon, some percentage of the total, must exist in the carbide and reduce its stability. Increasing silicon decreases annealing time and increases temper carbon nuclei.

Practical considerations again prevent use of too high silicon in which case the carbide is so unstable that primary graphite is produced. Silicon is a strengthener and the higher the silicon in the finished malleable iron, the higher the strength and yield point.

The third factor, atmosphere in the annealing oven, is unimportant directly, but very important indirectly. Modern controlled atmosphere furnaces eliminate packing and hence decrease both time and cost of annealing. A flexible furnace of this type eliminates another source of wasted time and fuel. When first stage graphitization is complete the time spent in cooling from the soaking temperature to just above the critical is wasted.

The fourth factor, cooling rate from the melt, brings up some puzzling theoretical questions. Some foundries, (notably one in Saginaw, Mich.) shake out the castings while they are still white hot. This results in faster annealing. As a laboratory experiment, Schwartz heated white iron, then quenched it, and found that subsequent annealing was hastened. Our tests showed that if ¼, ½ and ¾-inch diameter rods were cast in sand from the same ladle, the time for first stage annealing was 4, 6 and 10 hours respectively. Boegehold pointed this matter out in a paper over a year ago.

He demonstrated a fifth factor, rate of heating in the annealing cycle. He showed that heating slowly through the critical shortened the annealing cycle, caused finer and more temper carbon particles and tended to equalize differences between small and large castings. Bornstein produced figures showing the same trend.

Sixth factor is superheat of the melt. For some reason increasing the superheat temperature increases the malleablizing rate. In addition, the higher the superheat, the more silicon gets into the metal without primary graphite. Other aids in the same direction are the addition to the ladle or a late addition to the furnace of small quantities of steel or of scale. The latter, of course is not recommended in production.

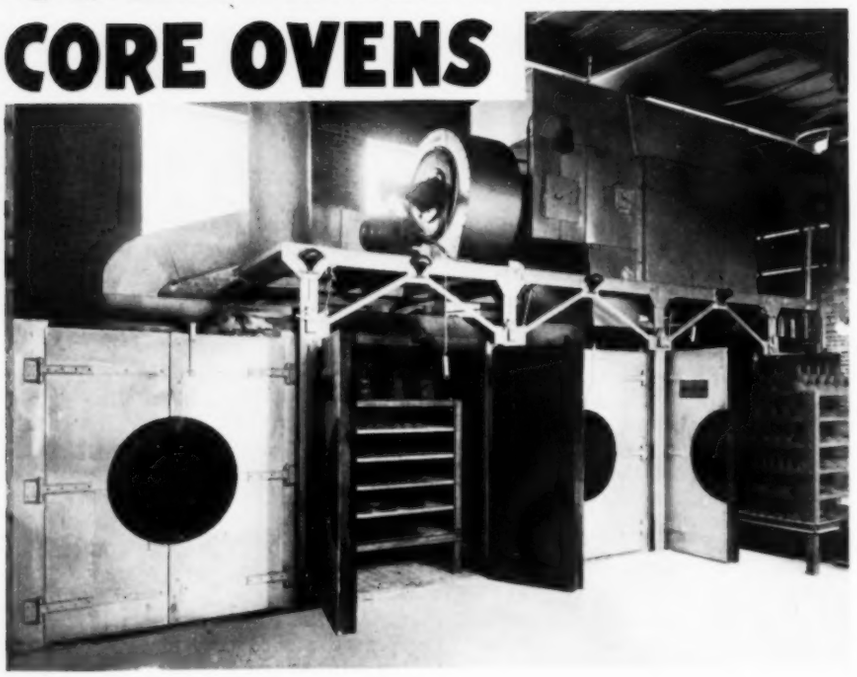
Melting Is Important

Seventh important factor is melting and casting practice. In a special instance very quick anneal malleable without mottle was made in sections up to 1-inch containing 2.7 per cent carbon and 1.7 per cent silicon. This was made in an electric furnace with a charge of steel, graphite and silvery pig. No sprue was permitted in these special heats. It is possible that the degree of oxidation of the melt, the slag and the temperature are controlling factors determining the silicon content.

Eighth factor involves the use of alloys. There are very few practical alloys the malleable man can even consider. Many alloys such as chromium and vanadium make it impossible to anneal. Nickel slightly increases the tendency for primary graphite and is too expensive for the benefits obtained. Copper offers some promise. Although it is a very mild graphitizer, satisfactory hard iron castings usually can be made with little tendency toward mottle. First stage graphitization is speeded up. Theoretically second stage is slightly slowed, but in a practical cycle, copper will decrease the overall annealing time.

Molybdenum is somewhat of a carbide stabilizer, but if 0.20 per

COLEMAN *Transrack* CORE OVENS



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cent molybdenum is balanced with 0.5 per cent copper, there is no appreciable influence or tendency to form primary graphite or on the annealing time. The yield point with a 2.3 per cent carbon will be raised to 40,000 pounds per square inch and better with equivalent increase in tensile strength. Elongation is not affected.

Silicon seems to be the best alloy. If the melting and casting practice is such that 1.5 per cent silicon can be obtained in a white iron, physical properties similar to the copper-molybdenum combination can be had in fully annealed iron. Annealing time will be as low as 13 to 14 hours in actual production.

Of course in pearlitic malleable, alloys are more practical. Manganese does not appreciably slow down first stage annealing but slows down second stage so markedly that any desired amount of combined carbon and hence physical properties may be obtained.

Considering the problem of annealing broadly and evaluating the factors entering into malleablizing, it would seem that the greatest improvement in efficiency probably can be obtained through the use of modern furnace equipment either of the batch or continuous type. The next step would be to investigate the melting process in an effort to increase the silicon content to as high a figure as is compatible with carbon content and castability. If neither of these steps are taken and special properties are required, the modern use of low priced alloys may prove helpful.

From a paper presented by Richard Schneidewind before the regional conference meeting of the Wisconsin Chapter A.F.A. in Milwaukee. The author is associate professor, department of chemical and metallurgical engineering, University of Michigan, Ann Arbor, Mich.
THE EDITORS

Book Review

Ingot Brass and Bronze; compiled, edited and issued by the Nonferrous Ingot Metal Institute, Chicago; price $5.00 in the United States.

The first edition of this technical manual contains six sections or chapters which deal with subjects of vital interest to the nonferrous foundryman, including the following: Economy and utility of ingot brass and bronze; nomenclature and classification; discussions of physical properties; definitions of terms relating to methods of testing; elaborate data on each of the 23 NFIMI standard alloys, including complete chemical specifications, average physical properties, instances of utility applications and cross references to specifications sponsored by various technical societies and government bodies; tabulations of miscellaneous specifications on brass and bronze ingots and castings currently in use by the sponsoring bodies.

A section of the manual is devoted to a discussion of approved foundry practice, melting, melting losses, deoxidation and fluxing, crucibles, refractories, pouring and pouring temperatures, gating, risering, molding, molding equipment, material handling equipment, molding sands, sand maintenance, cores, core sands, core binders. This section also contains suggestions and typical forms for keeping foundry records. An important section lists all the ordinary foundry defects and their causes as compiled by a special committee of the American Foundrymens' association.

The manual is authoritative and up to date and will be a distinct asset in the shop or office of the nonferrous foundryman. It is issued as a substantial and handsome ring binder with loose leaf pages 8½ x 11 inches. Supplemental information is to be issued from time to time in the two year period following 1940. This material will be forwarded to holders of the manual.

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Obituary

John S. Scott, 81, vice president of the Patterson Foundry & Machine Co., East Liverpool, O., died Dec. 30 in Texas.

* * *

Arthur G. Kimball, 60, president, Landers, Frary & Clark, New Britain, Conn., died Dec. 23, 1940, in the New Britain General hospital after a short illness.

* * *

Alfred Dunkerton, general foreman, foundry department of the Homestead works, Carnegie-Illinois Corp., died recently in Homestead hospital. Mr. Dunkerton was born in Wales and came to the Homestead district 48 years ago.

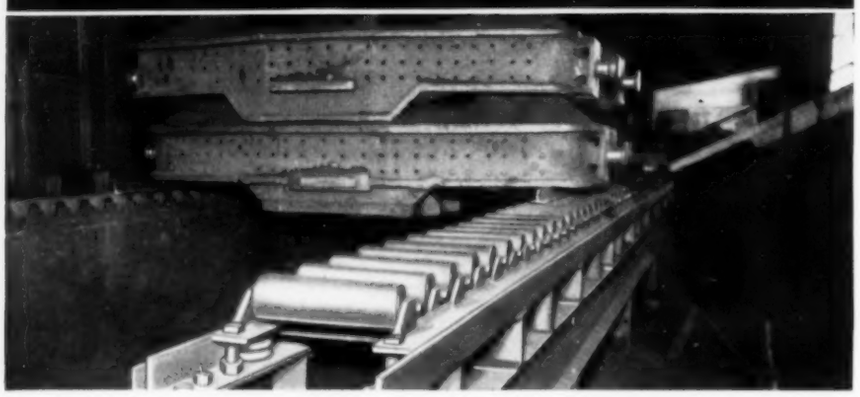
* * *

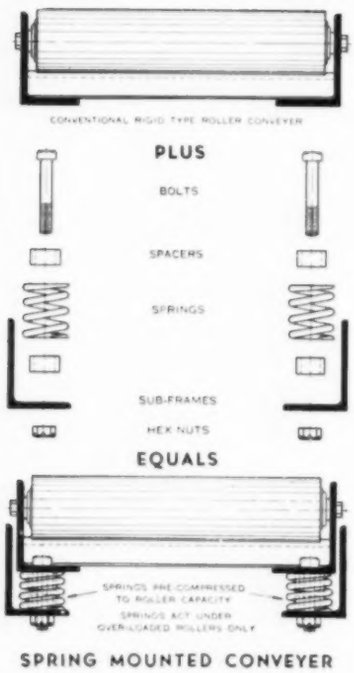
John M. Glass, president, the John M. Glass Co., Indianapolis, died Dec. 22 at his home in Cincinnati. Mr. Glass was born April 16, 1870 at Seymour, Ind. and spent his early life around Aurora, Ind. and Cleves, O. He was connected with the foundry supply industry for over 38 years. In 1902 he became associated with the Hill & Griffith Co., Cincinnati, and remained with that organization for 18 years, serving in the capacity of salesman in the Indiana territory and purchasing agent. In 1920 he left that concern to found the John M. Glass Co., representing the Werner G. Smith Co., Cleveland, in Indiana and handling a general line of foundry supplies.

* * *

Frank A. Russell, 61, chief clerk of foundries and pattern shops, Allis-Chalmers Mfg. Co., Milwaukee, died suddenly at his home Dec. 31, 1940. A youth of 18 he joined the company as a clerk, March 1, 1898, when the company operated under the title E. P. Allis Co. He was appointed assistant chief clerk of foundries in 1912 and became chief clerk in 1934.

MATHEWS SPRING MOUNTED CONVEYERS





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CONTINUOUS FLOW PRINCIPLE OF HANDLING MATERIALS

Describes Progress In Safety Work

The American Foundrymen's association, 222 West Adams street, Chicago, recently has prepared a reprint of an interesting paper entitled "A Practical Safety and Hygiene Program in a Small Foundry" which was presented at the Chicago convention of the association by Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O. This paper presents an interesting study of the splendid work carried on by that company, and details the gratifying results that have been accomplished.

Reader's Comment

Readers are invited to comment upon articles and other editorial material appearing in THE FOUNDRY. *The editors cannot publish unsigned communications, but at their discretion may permit a writer to use a pseudonym when a bona fide reason exists for withholding his identity. Letters should be brief.*

THE EDITORS

Daubing Mixture

TO THE EDITORS:

We note reference on page 48 of THE FOUNDRY for January regarding the use of a daubing mixture for lining bull ladles, particularly in a large automobile plant. You will be interested to know that firestone slabs also are used for that purpose in a number of foundries, including several automobile shops.

The stone is sawed 1½ inches thick across the grain, in 9 x 4½-inch slabs. Some very interesting reports have been received, including the claim that 27-inch ladles so lined will give service for about 2 weeks.

E. A. BURR, VICE PRESIDENT
Cleveland Quarries Co.
Cleveland.

GATING CASTINGS IS IMPORTANT

(Continued from page 47)

for one type of alloy is not necessarily the ideal for another type. For example, experience has proved that gating for iron castings that will yield a very high percentage of good castings if applied to red brass will not give enough good castings to be worthy of consideration. Gating practice which is satisfactory for red brass absolutely is out of the question for a high shrinkage alloy, such as aluminum bronze or manganese bronze. Proper gating for a good manganese bronze casting may work for the production of the *same* castings when poured in aluminum bronze. However, it may not and almost surely will not be as effective as gating practice that was planned deliberately for aluminum bronze and all of the different peculiar characteristics of that bronze were taken into consideration. One of the most obvious differences between the gating for red brass and for the high shrinkage alloy, manganese bronze, is the necessity for a much larger sized riser for manganese bronze than that for the red brass.

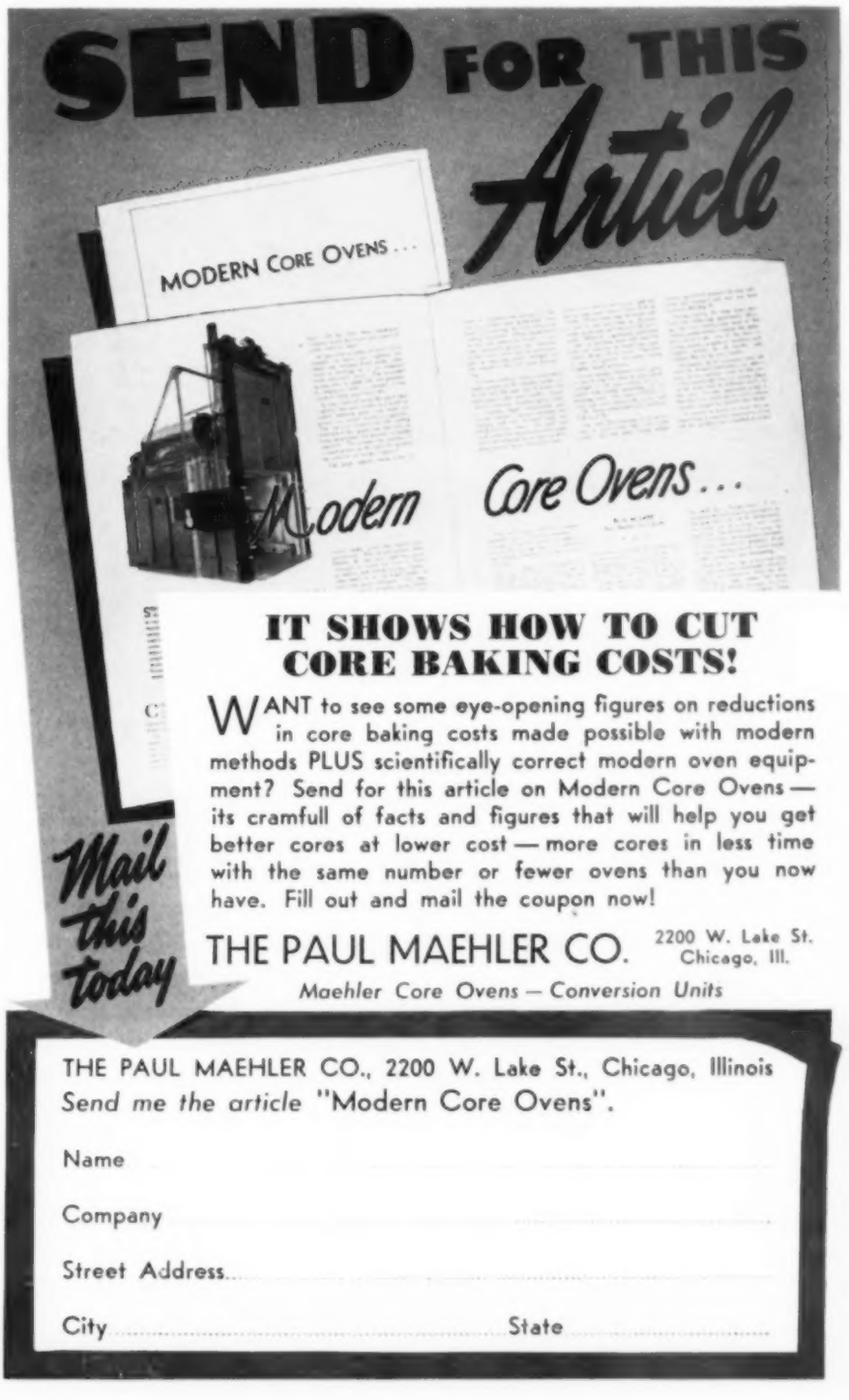
Some Solidify Quickly

In some of the red brasses solidification takes place so quickly that many foundrymen believe that no riser is necessary. However, the fact is, that the last metal to cool does need feeding and a microscopical examination of its structure when cast without a riser will show a distinctly open grain that would promise low physical properties under test.

Location of gates for a casting that is sufficiently large to require very long drop of the metal from pouring mouth to gate entrance of mold, is one thing as compared with the location of the gate for a casting where the drop is relatively short. This is due to the fact that as the metal falls, velocity increases with increasing height and, therefore, the further it has to drop, the greater the velocity with which the metal passes through a gate if that gate is of sufficient size to accommodate the flow of metal. From this it will be seen that the size and location of the gate must be considered both with respect to one another and to the drop required by the mold design. These and all the other factors listed in previous articles on the subject of gating must all be considered as the gating is being planned for the production of any given casting and done carefully to avoid future trouble.

Another important factor in the consideration of gating is the crystal growth that occurs during solidification of the different metals cast in the nonferrous foundries. That is one reason why some castings leak under hydrostatic pressure whereas others cast from the same pot of metal, gated similarly and to all appearances poured in the same way give satisfaction. To have the proper progression of cooling take place as previously discussed is one way of reducing the excessive crystal growth that will cause leakage.

However, if heavy sections in the castings induce slow cooling at the points where they are located, the crystal growth necessarily must be larger where these heavy sections exist than in neighboring sections where cooling occurs at a more rapid rate. Hence the necessity for planning the location of gates so that progressive cooling takes place and crystal growth is such to insure minimum development of the larger crystals at the points where heavy sections and light sections join. That will reduce the tendency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on leakage in castings to be used for purposes where hydrostatic service is necessary. Castings that appear to be thoroughly sound when fractured at these heavy sections frequently will leak. This leakage is to be expected at these points of heavy sections if the crystal size is enlarged excessively as compared with that of the normal crystal structure for the alloy in other parts of the casting which are not quite so heavy.

Consequently, it is wise to have those who are best equipped to consider all the different factors at their full value and make due allowance for each in arriving at the final plan of gating. Even where only a few castings are to be made, it will be found a definite source of economy to plan the gating beforehand, and if possible, provide the necessary set gate. That will relieve the molder of the necessity of cutting the gates and the responsibility for their location, size shape and direction and will pay in the long run.

We strongly recommend the use of set gates and the elimination of the practice of permitting the molder to be responsible for the gating of the casting. No two gates cut by the molder will be exactly alike in direction or shape. Consequently, no two castings will have exactly the same physical characteristics. In fact it is not certain that both of any two castings so gated will be capable of passing inspection or give the desired satisfaction in service.

In a future installment on the subject of gating the author plans to illustrate some interesting cases where thought was applied to the gating to insure proper progression of cooling and to describe the resulting satisfaction.

This is the fourth of a series of articles on gating nonferrous castings. The first three articles appeared in the November and December, 1940 and the January issues. The fifth will be presented in an early issue.

THE EDITORS.

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Test Hot Strength Of Molding Sand

(*Concluded from page* 40)

to high temperatures. Obviously, in considering the tests, we must think of time as well as temperature. In these particular tests time was constant while temperature varied. In the foundry both time and temperature are varied. Pouring a large heavy casting with 2600 degrees Fahr. iron surely creates higher sand temperatures than pouring a small casting with iron at a temperature of 2850 degrees Fahr.

This means that neither dry strength nor hot strength tests should be used to predict casting results without much further study in the foundry to establish the hot strengths required for particular weights and classes of castings. The foregoing information is given as a possible aid in such study. It seems desirable that hot strength should be held to the minimum point that will prevent washing and that will insure easy shake out, a minimum amount of lumpy sand and lessened danger of cracked castings.

Forecasting Sales

An analysis of forecasting sales has been issued as a booklet by the Policyholders Service bureau, Metropolitan Life Insurance Co., 1 Madison avenue, New York. In an effort to present a composite study of representative forecasting methods and procedures, the bureau conducted a survey of the subject and obtained information on the experiences of 48 companies which are primarily in the manufacturing field and which represent many industries. In most cases their forecasting experience dates back several years.

WHEN TIME IS ESSENTIAL

(*Continued from page* 43)

just as a foot is a unit of length and a pound is a unit of weight. It represents the illumination on a surface one foot from the flame of a standard candle and at right angles to it.

All foot-candle recommendations are really compromises between ideal illumination values and economic considerations. Laboratory tests have shown that people see most accurately and comfortably and with a minimum of wasted effort under illumination levels that range in the hundreds of foot-candles (depending on the seeing task) rather than in the tens or twenties that often are provided by artificial lighting systems. Thus every foot-candle recommendation must be regarded as a *minimum* value that has been more or less arbitrarily established in practice. Invariably whenever the user of light finds that he can afford to have more illumination than this minimum he is well repaid by availing himself of it.

Inspection Needs Light

One part of the foundry that may require supplementary lighting is the section where the castings are inspected. Since castings vary tremendously in shape and size and in the sort of inspection they require, various methods of producing the supplementary lighting may be employed. In general, however, most satisfactory results may be expected if the lighting is provided by large-area diffusing units of some sort suspended relatively close to the point of inspection, rather than by concentrating reflector equipments which may cause reflected glare. Although the amount of light required will vary with the difficulty of the inspection task, it is probably safe to regard 50 foot-candles as a minimum for service.

General lighting usually is most satisfactory when the illumination is distributed evenly throughout the area lighted. Spotty lighting is likely to cause harsh shadows and often penalizes the workers in the poorly lighted areas. Other things being equal, the quality of the product should be more uniform if adequate lighting is provided throughout all the areas where work is done. In low-bay and medium-bay sections relatively uniform lighting can be achieved if the lighting units are spaced no farther apart than their mounting height. Somewhat closer relative spacing usually is required in high-bay areas because of the more concentrating reflectors used.

What type of lamp and reflector equipment shall be selected? Where low cost of initial installation is of paramount importance the choice invariably will be filament lamps. Low-bay and medium-bay areas may be lighted very satisfactorily by white bowl filament lamps in RLM dome reflectors. High-bay areas in which the units are suspended 30 feet or more above the floor may be lighted by clear filament lamps in high-bay reflector equipments.

Where alternating current is available, more efficient lighting may be secured by using mercury or fluorescent lamps. The 400-watt mercury lamp has been available for several years and has been used with excellent results in foundries and many other industrial interiors for high-bay lighting. The light produced is yellow-green in color, and since it is almost entirely lacking in red it is psychologically cool. Work done in a foundry does not require color matching or color discrimination; hence the color of the light produced by mercury lamps is not objectionable from a practical viewpoint.

Because of the nature of the work

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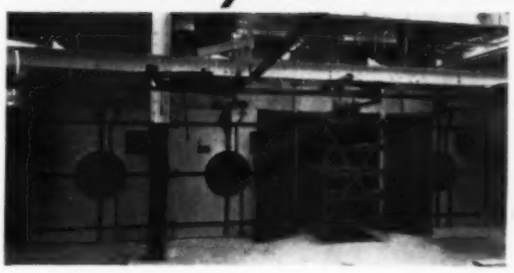

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carried on in a foundry the stroboscopic effect (flicker) that is characteristic of mercury lamps is not objectionable. It can be reduced greatly where the light from two units overlaps, by operating the lamps on tulamp ballasts, two lamps to one ballast. This also is one method of raising the power factor from 65 per cent to over 90 per cent. Mercury lamps require several minutes to reach full brilliancy after being turned on, and if the current is interrupted during operation they will not relight until they have cooled off for several minutes. This characteristic of the lamps makes them unsuitable for intermittent service, but where lamps are used continuously for extended periods as they are in the foundry no inconvenience because of this characteristic has been reported from the many installations in service.

Mercury lamps are roughly twice as efficient as filament lamps of comparable wattage. However, they require auxiliary equipment while filament lamps do not, and this makes the initial cost of mercury lighting higher than that of filament lighting. Which type of lamp will provide the more economical lighting in the long run will depend upon such factors as number of hours the lamps are used annually, cost of electrical energy, and period of time over which the cost of the installation is amortized. Where electrical energy costs over a cent per kilowatt hour, mercury lighting usually is found to be more economical than filament lighting.

Fluorescent lighting is now nearly 3 years old and its popularity is growing every day. There are two types of fluorescent lamps — the Mazda F and the RF lamps.

Mazda F lamps are from two to three times as efficient as filament lamps. They provide lighting of very good quality because the large area of the tube diffuses the light well and the low source brightness keeps direct and reflected glare at a minimum. These lamps are used, generally in pairs, in industrial reflector equipments, such as the RLM type, that distribute the light in about the same way as do the familiar RLM dome reflectors that employ filament lamps. At present the 40-watt, 48-inch Mazda F lamp is most used for general lighting, but undoubtedly the new 100-watt, 60-inch lamp will find increasing application since there has been considerable demand for fluorescent lamps of higher wattage.

Gives White Light

Mazda F lamps permit some choice as to the color of the light, since they are available in both daylight and white. The light provided by the daylight lamps is a close approximation to natural daylight in color and hence blends well with daylight that enters from windows or skylights. Psychologically it creates an atmosphere of coolness and efficiency and often is preferred for that reason. White lamps produce light that is warmer in tone. They offer the advantage of being somewhat more efficient than the daylight lamps. Choice of color is a matter of opinion and must be made by the user on the basis of the advantage offered by each color.

The type RF fluorescent lamp is 58 inches long and consumes 85 watts. Taking into account wattage consumed by the auxiliaries, single-lamp units are rated at 100 watts and two-lamp units at 200 watts. The lamp operates on the full-wave rectified principle and therefore has very little stroboscopic effect. So far as color is concerned, the RF lamp may be had in blue-white or industrial white. Either color blends well with daylight, is psychologically cool and hence agreeable to the worker. Objects and people appear somewhat more natural in the industrial white.

Logical applications in the foundry for fluorescent lamps of either type include providing general lighting in low-bay areas and supple-

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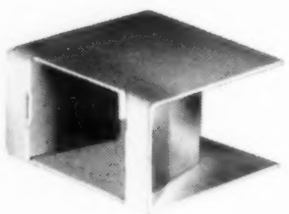

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mentary lighting for inspection in units mounted close to the work being inspected. One of the most important advantages offered by fluorescent lamps is the fact that they make possible higher levels of illumination than have ever been practical with filament lamps. This is true because the lamps produce more than twice as much light as filament lamps for a given expenditure of electrical energy. Obviously this is an advantage under any circumstances, but it is a particularly important one in buildings where the existing lighting load taxes the wiring system to capacity. In such buildings it is impossible to increase the illumination with filament lamps without costly rewiring. By installing a system of fluorescent lighting it becomes possible to double, or under favorable circumstances to triple the illumination without the necessity of rewiring. Since foot-candle recommendations admittedly are compromises and since levels higher than the recommendations are known to be desirable, it would seem logical to double the standard recommendations whenever fluorescent lighting is installed.

Regardless of the type of lighting system installed in a foundry, no consideration affecting lighting can be more important than proper maintenance. Smokiness of the interior makes this a serious problem, for the accumulation of smoke particles and dirt on the lamps and reflectors results in relatively rapid depreciation of the light output—sometimes as much as 20 per cent in a single month.

Maintenance involves replacing lamps and cleaning lamps and reflectors. This work usually is performed most efficiently if it is the responsibility of the plant operating or buildings and grounds department, since the productive departments often are too busy with specialized problems to give maintenance the attention it deserves.

The simplest and best way to establish a cleaning schedule is to make periodic checks of the illumination with a light meter. If satisfactory performance is to be obtained from the lighting and the investment made in it is to be justified, the equipment should be cleaned when the illumination drops to two-thirds of its initial value. In a foundry this means frequent cleanings, perhaps as often as every three or four weeks.

Cost of cleaning is affected by a number of factors, such as the type of luminaires, their location, the efficiency of the personnel assigned to the work, and the wages paid to them. The average cost of cleaning open porcelain enamel industrial reflectors at 10 to 12-foot mounting heights was found to be 10 cents per unit, based on data collected from several plants. For 18 to 20-foot mounting heights the cost was found to be between 15 and 20 cents per unit. Estimated cost in high-bays is 30 cents per unit where a crane is available, and 40 cents per unit where climbing is necessary. Cleaning cost, however, is such a small proportion of the total cost of light that variations in it affect only slightly the frequency of cleaning for most economical operation.

Cleaning the lighting equipment is best done by taking the reflector down and washing it with a detergent or solvent and warm water. Alkaline solvents are satisfactory on porcelain enamel or glass surfaces, but not on aluminum surfaces since the alkali tends to attack the metal. Aluminum reflectors are best washed with liquid wax or wax emulsions or with neutral solvents.

A common practice that by all means should be avoided is that of wiping reflectors with a dry cloth at the time that lamps are replaced. This not only fails to clean the reflector thoroughly but also mars the reflecting surface by driving grit and grime into it.

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cipal advantage lies in the reduction of dirt on sockets, which otherwise may become clogged, making it difficult to remove or insert lamps. Although all enclosed lighting equipments have a tendency to "breathe", due to the expansion and contraction of air as the units are turned on and off, the amount of dust and dirt that accumulates inside the units is negligible compared to the amount that collects in open units. Nevertheless it is advisable to give dust-tight equipments a thorough washing inside and out at the time of lamp replacement. Intervening cleanings are simplified since it is necessary to wash only the glass roundel which transmits light.

In an article of this sort it is impossible to discuss lighting in any more than broad generalities. It is not expected that the reader will now be able to design a lighting system for his plant. Every foundry presents an individual problem in lighting and its importance to efficient plant operation makes it well worth while to have the best technical advice in selecting the lighting equipment and designing the lighting system. Fortunately the services of an expert illuminating engineer almost always are available at no cost or obligation through the local electric utility company, and the foundry executive is urged to avail himself of this assistance when lighting or relighting his plant.

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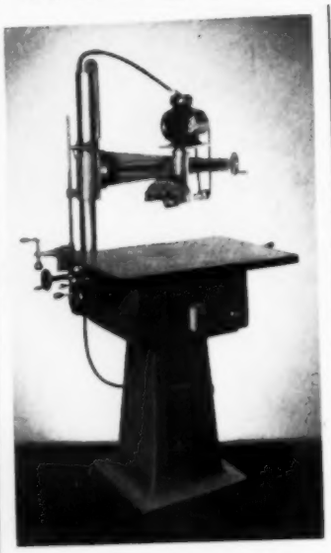

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Plans New York Convention

(*Concluded from page* 41)

Cech, Cleveland Trade school, Cleveland; *Gray Iron Castings*, Fred J. Walls, International Nickel Co., Detroit; *Nonferrous Round Table*, C V. Nass, Fairbanks Morse & Co., Beloit, Wis.; *Nonferrous Castings*, R. W. Parsons, Ohio Brass Co., Mansfield, O.; *Sand Research*, Dr. H. Ries, Ithaca, N. Y.; *Gray Iron Shop Course*, K. H. Priestley,, Eaton-Erb Foundry division, Eaton Mfg. Co., Vassar, Mich.; *Sand Shop Course*, E. E. Woodliff, Harry W. Dieterl Co., Detroit.

The American Foundrymen's association has not met in New York since the tenth annual meeting was held in the Eastern metropolis in 1905. Without detracting from the other cities where most successful A. F. A. conventions have been held, it might be pointed out that no other spot in the country offers so much of interest to the convention visitor as the island of Manhattan and the territory immediately surrounding. Foundrymen also will find that the New York district includes a wide variety of foundries which should make an interesting plant visitation program possible. Undoubtedly the numerous attractions available in New York should provide additional incentive for convention attendance.

Thus far, foundries along the Eastern seaboard have felt most of the pressure of defense work. While all plants throughout the country undoubtedly will be working at approximate capacity by convention time, foundrymen from every part of the country should gain much of value through exchanging experiences on the various problems connected with defense work. Through the convention and its discussions, it is believed that foundries will be able better to meet the demands of the armed forces of America in providing for total defense.

Bulletin Available

Printed copies of simplified practice recommendation R58-36, classification of iron and steel scrap, again are available through the Superintendent of Documents, Washington, for five cents each, according to an announcement of the division of simplified practice, bureau of standards.

PROGRESS AIDS DEFENSE

(*Continued from page* 45)

action. Steel foundries are starting production on cast steel turrets and armor for tanks, armor for military trucks and light gun shields and mounts, shells and ship castings.

Nonferrous foundries are getting into mass production of castings for rotary airplane motors. Others are equipping for quantity production of the large aluminum castings required for the Rolls Royce airplane motor which will need some of the largest size molding machines in use in this country.

Malleable and gray iron foundries are stepping up production as fast as requirements are received. The largest and best equipped foundry in the country exclusively for machine tool castings, started in operation last month, and materially should help machine tool production manufacturers.

Trend towards mechanization of all operations continues progressively with keen interest in larger units and special types of molding machines, sand conditioning units, blast cleaning equipment, conveyors and cranes.

With the necessity of less and less heavy manual lifting and the improved ventilation, lighting, sanitary conditions, etc., the foundries offer such excellent working conditions that high-class labor is attracted and kept.

During 1940 metallurgical progress has advanced steadily. Foundrymen know their product, know what it will do and when and where it should be used. Most of them have lost any inferiority complex about castings and are competing successfully with welded structures.

The nation can depend on foundrymen doing their full share in producing national defense requirements during 1941.

Steady Progress Is Noted In Steel Castings Field

By FREDERICK A. MELMOTH
Vice President
Detroit Steel Casting Co., Detroit

DURING 1940 the industry continued the steady technological progress which has been exhibited for the past few years, and most certainly at a pace quite equal to, or greater than, before.

Technically, integrity of castings has been the watchword throughout the industry. Manufacturing methods, based upon careful investigation and the use in greater degree of all control practices, have concentrated upon the realization in the casting itself of the potentially always present unexcelled characteristics of steel.

Further extension of heat treatment, particularly quenching followed by suitable tempering operations and differential heat treatment calculated to fit castings into definite new spheres of performance, have occurred. Flame hardening of desired areas of surfaces in the presence of suitable chemical compositions to insure success also has opened up numerous new avenues of application.

Gamma and x-ray examinations have widened in their use from the viewpoint of assistance in manufacturing control, and the certainty of internal soundness. The magnaflux type of defect detection also has developed in greater application to steel castings.

Foundries themselves have utilized energetically all possible technical advancement in steelmaking methods. This together with the extending appreciation of users of steel cast-

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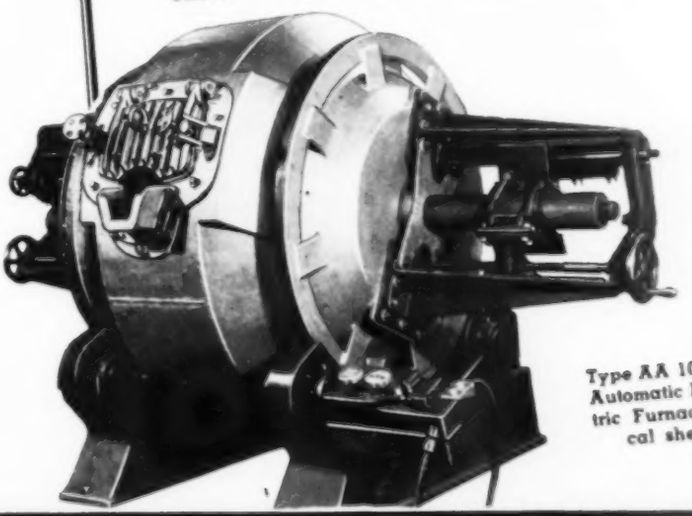

Type AA 1000 lb. Detroit Automatic Rocking Electric Furnace with conical shell design.

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ings of the prime importance of design, is rapidly enabling the steel founder to approach such success in manufacture as will enable the use of castings in a constantly increasing degree. Proof of this exists in many industries utilizing castings in a perfectly satisfactory manner for more and more purposes previously denied them.

Better steelmaking, controlled mold materials, scientific and adequate heat treatment, and common sense design will combine progressively to further enlarge the field of application of steel castings of all types and sizes, particularly in such times as the present when demands of rearmament add emphasis to the necessity of making it possible for each and every industry to carry its full share of involved work.

From the technical association point of view one should not fail to mention that the year 1940 has seen a new edition of the *Cast Metals Handbook*, and the first edition of the *Steel Castings Handbook*, which are the results of efforts by the American Foundrymen's association and the Steel Founders' Society of America respectively. These two books represent a veritable encyclopedia of information and their publication certainly represents one of the high spots of the founding industry's efforts, not only to improve its product, but to publicize authentic information regarding it.

Graphitizable Steels Find Increased Applications

By HARRY A. SCHWARTZ
Manager of Research
National Malleable & Steel Castings Co., Cleveland

IF I am to pick out a single item from the year's developments, it is perhaps the progress made in the use of graphitizable steels. These are materials having a carbon content intermediate between malleable iron and high carbon cast steels, which are capable of graphitization and seem to have found their greatest application when only partially graphitized. Very commonly they seem to find favor when containing additional alloying elements.

These materials combine great tensile strengths with adequate, though not high, ductility and ease of machining.

Gray Iron Industry Studies Scientific Methods

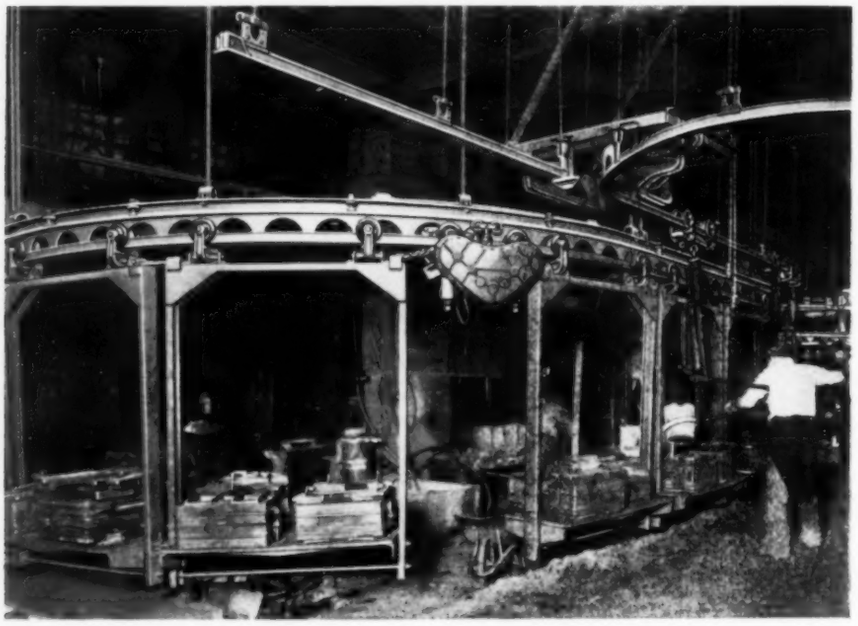
By CHARLES HOEHN
Chairman
Enterprise Foundry Co., San Francisco

MOST important problem right now, of course, is better castings and in greater volume. The trend is to more intense study of scientific methods in the foundry and especially so by the younger men in the industry. I consider the following items of progress of greatest benefit to our industry.

Radiography, or in other words, gamma-ray examinations of castings, has done more to take the guess work out of the manufacture of castings than any other one method developed in recent years. Foundrymen did not welcome its adoption in the early stages as it was just one more excuse to scrap a perfectly serviceable casting. However, since its adoption as a help rather than a hindrance, great advances have been made in the production of sounder castings.

Progressive solidification: The importance of this phase of the casting business is better understood and is receiving most serious consideration.

Late additions of silicon to cast iron is responsible for greatly improved control in the production of iron castings containing high percentages of steel scrap, together with alloy additions. Castings so treated have an evenness of struc-



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ture which is highly desirable.

Heat treatment and normalizing of both iron and steel castings makes it possible today to machine castings to minute tolerances without serious danger of change of shape after machining.

Importance of sand control and the selection of the best sand available for the purpose for which it is intended, together with its proper preparation is more widely understood and appreciated by the foundryman than at any time in foundry history.

Improvement Continues in the Gray Iron Field

By GARNET P. PHILLIPS
Chief Metallurgist
Automotive Foundry Division
International Harvester Co., Chicago

PAST year has seen no single outstanding development in the gray iron casting industry, but rather gradual and continuing improvement in practically all phases.

The melting of iron all operations involved in cupola melting continued to receive study for better control and lower costs. Better equipment for weighing metal and fuel, increasing use of blast control equipment, mechanical charging improvement and study of the benefits of control of moisture in the blast used all received attention. Increasing use of special irons resulted in further use of electric furnace melting and duplexing. Use of insulated, covered mixing and transport ladles was extended.

Molding sands continued to receive study. Use of sand testing equipment increased for determination and control of moisture, permeability strength, flowability, refractoriness, etc. Similarly, the extremely important factor of core mixtures, baking and core properties received added attention. Simplification of mixtures and evaluation of ingredients were factors studied. Core blowing was further extended with better core quality and lower costs resulting.

Heat treatment of castings to eliminate strains was further extended. Annealing for increased machinability is being used more extensively on castings that are to be hardened. Heat treatments for hardening in all the various fields, oil quenching and drawing, flame hardening of suitable irons and castings, hot quenching, induction hardening, etc.) was the object of much research and study.

In the field of alloy iron application, there was a continued searching scrutiny of the various compositions used for each application. The need for decreased costs with equal or better performance dictated the work done in this field. One result is that proof is obtained of the need for the alloy or alloy combination used in each application. This work will continue as costs increase.

Whiteprint Machine

Ozalid Corp., Johnson City, N. Y., has introduced a printer and dry developing unit built into a single compact machine in which are incorporated facilities necessary to turn out dry developed whiteprints. Equipped with a new type high pressure mercury vapor lamp which uses 40 watts per inch and has an active length of 46 inches, the machine will print materials at speeds up to 56 inches per minute. The lamp gives uniform light distribution over the entire surface. An adustable light shade allows the operator to vary exposure without changing printing speed, an important feature in working with variations in tracing transparency. The lamp is cooled with a two stage blower and a specially designed air duct.

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MOLDING DIESEL ENGINE CRANKCASES

(*Continued from page* 34)

around the pattern. Facing sand, of course, is placed next to the pattern and tucked in before the backing sand is put into the mold. That cycle of placing and ramming facing sand and backing sand is continued until the top of the flask is reached. Then the second section of the cheek is set in position, and the same procedure followed until the sand is within a few inches of the top. At that point only facing sand is used, and the runner sticks, smooth pieces of 2 x 2-inch lumber, are bedded in around the four sides. After the runner sticks are located, sand is rammed in until flush with the top of the flask.

Excess sand is struck off, and then the pan section of the pattern is mounted on the body pattern in the mold. The cope flask is placed in position and the short gate sticks arranged over those in the cheek mold. The flask is filled with sand, rammed and struck off. The cope mold is removed, rolled over, and the face of the mold nailed at various points to prevent any possibility of the sand lifting off when struck by the molten metal. The cope then is transported to the oven for drying over night.

After the cope is removed, the pan pattern is lifted off the body pattern, the runner sticks pulled from the sand, and the top gates cut. The top gates are about 2 inches wide and 1-inch deep. Six are cut on each of the long sides approximately 2 feet apart, as may be observed from Fig. 9. The body pattern is drawn from the mold, the gate sticks removed, and the bottom and side gates to the mold cavity are cut into the sprue cavities left by the sticks. Bottom and side gates are ¾-inch wide and 4 inches high. The bottom gates enter at the joint between drag and cheek molds while the side gates enter at a point approximately two-thirds the distance from the bottom to the top of the mold.

Nail the Mold Face

Following those operations the mold face is nailed to prevent breaking, particularly on the sharp edges of corners around core prints. At the completion of that work the cheek is carried to the oven for drying. After the mold is dried it is set in position over the drag, and both are sprayed with blacking which is slicked carefully to make a smooth surface. Since the molds are still quite warm, the blacking dries fairly rapidly so that core setting is started right after the blacking is finished. The first cores to be set are those along the sides which form the various openings in the casting. They are pasted and secured carefully, and the joints filled to eliminate any fins.

Next cores to be set are the main body cores of which there are 12. They are provided with suitable eyes or loops at the top and bottom, and also with prints on the top for location of the lightening cores. The eyes at the bottom are for the hook bolts by which the cores are secured through the drag, and the eyes at the top are for wiring the lightening cores tightly in position. Some idea of the cores and the procedure in setting may be gained from Fig. 1 which is a view of the operation on the upper half crankcase. After the cores are set, bolted and wired, and various openings between and in cores are filled, the mold appears as in Fig. 10. Next step is placing in position and clamping the cope which is followed by construction of two runner boxes, one at each end of the mold, to conduct the molten metal into the mold.

It should be pointed out that sequence of operations in production of the lower and upper halves of

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crankcases is such that drying, molding and coring of both castings are staggered. That procedure eliminates overloading and delays at the ovens, awaiting for flask and crane service on floors, and other time wasting delays so that two complete castings, an upper and a lower half are made in three days by 7 molders and 7 helpers.

Molding of the upper half crankcase is quite similar to that used in producing the lower half with some slight differences in procedure. The first is that the pattern is placed on a board in the position the casting later is used—that is to say with the holes for the cylinders up, as shown in Fig. 11. Then the cheek flask is filled with sand and rammed, as described in the case of the lower half. Excess sand is struck off and the drag flask placed in position. Now instead of ramming up the flask as ordinarily practiced, and nailing the face after lifting the drag from the cheek, an unusual procedure is followed. It consists in standing the nails on their heads all over the top of the pattern wherever required, and then riddling on a thin layer of facing sand. That can be done since the pattern face is flat, and according to experience of the company does not require any longer time than the regular method of nailing. It does possess the advantage that it eliminates the care required in nailing at sharp edges to prevent breaking them, and the patching labor when that occurs.

Placed on Pattern

While on first thought it seems as though riddled sand dropping on the nails would knock them over, it is surprising how few do fall over—only a half a dozen or so—and they are reset easily. One of the secrets of the procedure which maintains the nails erect, is riddling the sand in such a manner that it falls as nearly vertical as possible. Hence, the molder stands up on top of the mold while riddling since the additional height permits a straighter drop. Only a comparatively thin layer of sand must be placed in that manner after which less care is required in putting the sand in the flask. When the nails are covered sufficiently the sand is rammed, more sand is placed and rammed, and the cycle followed until the flask is filled.

The excess sand is struck off, and then both cheek and drag and rolled over together. The pattern is withdrawn, and the vertical faces of the mold are nailed at vital points as in cases previously described. The mold is transferred to the oven for drying, and after removal from the oven is blacked and slicked. Since the cope is flat, it is rammed separately and finished. Following blacking the cores are set. As may be observed in Fig. 1, gating is the same as used for the lower half crankcase. Coring and other steps to obtain the final mold are the same as described for the lower crankcase.

Another job in production at the Lake Erie Engineering Co. is shown in Figs. 3 and 8—an 18-foot flywheel cast in halves, each half weighing about 26,000 pounds. As may be seen in the illustrations, the job is made in the floor, and the molding procedure is a combination of sweep molding and cores. First step is preparation of the bed, using a deep layer of cinders to insure adequate venting, followed by a layer of molding sand which is tramped down and leveled off roughly. The spindle for the sweeps is located, driven in firmly, and the thrust collar on which the sweeps rest, is placed in position.

Following those operations the hub bearing is made in loam on a single layer of common, red brick, using a short sweep. Next step is forming the bottom face of the outer rim or flange of the wheel. That likewise is made in loam swept up on a single layer of brick, as may be seen in the immediate foreground in Fig. 8. During that operation the sprues and gates also are placed in

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position. They are made in dry sand in the shape of the letter *L*, and arranged so that the metal enters the mold cavity from below. As may be seen from Figs. 3 and 8, the gates are located on opposite sides just adjacent to the diametrically opposed arms, but not in the center of a pair of arms. Each gate block contains three openings around 2 x 2 inches.

Next step is sweeping up the bed in between the hub bearing and the rim, and upon which the arm cores are placed. That bed is made of molding sand carefully tramped in layers to give a firm foundation, and then struck off with a sweep to provide a smooth level surface. The arm cores are located in the proper position, as shown in Fig. 8, and then the outside and inside faces of the wheel rim or flange are rammed up in molding sand. For that operation only a segment of the rim form is used, and it is attached to the spindle with an apron to insure steadiness and proper location. After forming the inside and outside faces, vital points are nailed, and then those portions are blacked, slicked and dried with a gas torch.

The hub is formed in a core which is made in two parts and the next operation is placing those in position. Bottom half is located, and then the top half is pasted in position. Rim of the flywheel is covered by segmental slab cores, and the remainder of the mold filled with molding sand to provide a smooth, level surface for location of the bars and weights applied to the mold top to resist the ferrostatic pressure developed when the mold is poured.

Fig. 5 shows several steps in the production of manhole frames which are made by hand. The pattern is mounted on a board as indicated in the center view, and the drag flask is placed in position, filled with sand and rammed. A bottom board is rubbed on, clamped and then the whole is rolled over. After the pattern is drawn the mold appears as at the left. The mold face is nailed all around the upper edge, as shown in that view, and the center core is placed in position, as indicated at the right. The cope is flat, and the casting is poured from a central sprue made in dry sand which feeds metal into 4 branch gates leading into the lower rim of the casting at equidistantly spaced points.

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Book Review

Torch of Civilization, by Matthew Luckiesh, 269 pages, published by G. P. Putnam's Sons, New York.

The story of man's conquest of darkness, from the earliest civilization to the present time, with a glance into the future, is treated in a most interesting manner by Dr. Luckiesh, director of the Lighting Research laboratory, General Electric Co., Cleveland. Every type of up-to-date equipment in the field of lighting is described in detail. Dependence of man upon artificial light is shown in this quotation:

A great European capital lies under the pall of a black-out. Stone-Age brutality has temporarily extinguished the torch of civilization. Artificial light, the life-blood of civilized activities, has been reduced to a mere trickle outdoors. Traffic gropes in sudden unfamiliar blindness. Human beings creep and stumble, and even die, in their helplessness. In effect the black-out has robbed them of sight. Those civilized human beings had long taken artificial light for granted, as most of us have. Immersed in the enjoyment of the independence which it has bestowed upon us, we become unconscious of its beneficence. In the last century artificial light extended the civilized day to the full limit of 24 hours. Most of us forget, most of the time, that without modern artificial light, activities are largely bounded by sunrise and sunset as they were—and still are—for primitive human beings. Instead, we work, play and travel as independent of daylight as we choose. Only when the light fails temporarily do we realize that artificial light is literally the life-blood of modern civilization.

Abstracts

FROM WORLD FOUNDRY LITERATURE

Nickel Bronzes

A General Utility Nonferrous Casting Alloy, by A. Dunlop, *Foundry Trade Journal*, London, England, May 30, 1940.

The alloy described in this article is a variation of the 88-10-2 alloy known as admiralty or gun metal in which nickel is substituted for part of the tin making the composition 88 per cent copper, 5 per cent tin, 5 per cent nickel, and 2 per cent zinc. The author points out that in the as-cast state, the properties are better than the 88-10-2 alloy particularly in impact where the Izod value for the nickel bearing bronze is 51 foot-pounds as compared to 17 foot-pounds for the regular alloy. The nickel bronze may be heat treated to gain further improvement in certain mechanical properties. The metal shows excellent resistance to hydraulic pressure in both the as-cast and heat treated state; castings as thin as $\frac{1}{4}$-inch withstanding internal water pressure as high as 1000 pounds per square inch. The author believes that nickel bronze will serve also as a bearing material although insufficient data is available as yet. However, heat treated nickel bronze bearings on a centrifugal water pump have been in operation continuously for nine months without trouble.

Melting Losses

Metal Losses in Melting in the Cupola (Der Abbrand beim Schmelzen im Kupolofen) by R. Gerisch, *Die Giesserei*, Duesseldorf, Germany, March 8, 1940.

The author discusses the causes of these losses, such as the use of scrap iron heavily coated with rust, sand, paint or scale, which are all weighed in with the iron and go into the slag. Losses of iron also are caused by ladles filled too full, poor ladle spouts and too fast pouring. Defective molds are causes of iron losses. In some cases apparently high iron losses are due to failure to weigh carefully the components of the charge going into the cupola, and of course inaccurate scales also affect the correct determination of the losses.

Where small defective castings form part of the charge going into the cupola, the sand adhering to the castings constitutes a large percentage of the total weight of the charge. In the case of heavy scrap iron, the coating of dirt, grease, paint etc., generally does not average more than 1 per cent of the total weight.

The manganese and silicon losses are also discussed.

Magnesium Castings

Fabrication of Magnesium Alloys, by L. E. Day, *The Metal Industry*, London, England, May 3, 10, and 17, 1940.

In this series of three articles the author presents information on various processes employed in fabricating magnesium alloys. The first begins with melting pointing out that it can be accomplished in gas, oil-fired, coke-fired or electric resistance furnaces using steel pots or crucibles. The furnace must be such that the alloy can be heated up to 800 degrees Cent. A flux must be employed, and the best base is magnesium chloride to which other salts may be added. Due to magnesium's affinity for water, an inhibitor must be added to molding sand to prevent any reaction. Several different types of inhibitors are available and include sulphur in combination with borax, and ammonium bifluoride.

Molding sands used should possess high permeability to insure adequate venting of gases from the mold. The author recommends synthetic molding sand com-

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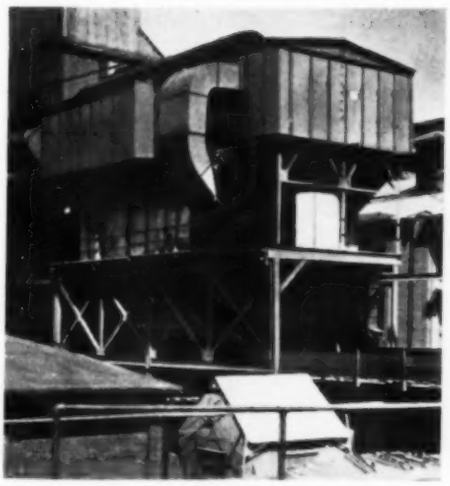

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pounded from graded silica sand with bentonite as the binder. Molten metal should enter the mold with as little turbulence as possible. To that end the author suggests staggered or stepped sprues with rectangular section to avoid formation of a vortex. Alloys mainly used for sand casting contain 8 and 10 per cent aluminum. Both can be heat treated —using a solution treatment at 400 to 420 degrees Cent. for a period of 20 to 30 hours. Alloys containing more than 9 per cent aluminum are susceptible to precipitation hardening at 170 to 200 degrees for 12 to 20 hours.

Gray Iron Contraction

Some Observations on Contraction in Gray Cast Iron, by E. Longden, *Foundry Trade Journal*, London, England, June 13, 1940.

The author reports results obtained from an investigation of contraction in large castings including boring bars 18 inches in diameter and 45 feet long, and 22 inches in diameter and 47 feet long, and a bed casting for a grinder 41 feet 7 inches long. His conclusions are that thick bars or sections contract more than thinner bars or sections when those varied section members are linked together as a single piece casting which is the opposite when such sections are cast separately. An explanation is that in the case of the one-piece casting, the thin or comparatively light sections are subjected to an extensional stress during freezing and cooling of the metal, created by resistance of the thicker sections which are not ready to contract. Frictional resistance of mold and cores, and expansion of cores when heated up by molten metal also tend to subject the cooling metal to extensional stress. Study of the very clear arrest and expansion periods noted on the cooling curves indicates that a thick section of a casting may be undergoing an expansion at a time when a thinner section has passed its expansion phase and is in a state of contracting. Under those conditions the thin sections will suffer extensional stress.

Nickel Bronze Alloy

Nickel Bronzes, by J. McNeil, *The Australasian Engineer*, Sydney, Australia, May 7, 1940.

Nickel bronzes, according to the author, may be divided into 3 groups including those containing up to 5 per cent nickel; those containing between 5 and 10 per cent nickel, and high nickel content bronzes. He points out that in the first group nickel is added to leaded alloys to eliminate lead sweat or segregation, and to improve physical properties. However, in the case of bronzes containing only small amounts of lead nickel while increasing the melting point slightly, increases fluidity, and refines the structure and assists in promoting pressure tightness.

In the intermediate group containing from 5 to 10 per cent nickel, the nickel increases retention of strength at elevated temperature, and makes the alloy amenable to heat treatment. By heat treatment a wide range of physical properties can be obtained. In the third group containing nickel contents up to 70 per cent, which provide a useful combination of properties including high hardness, retention of strength at elevated temperatures, and good corrosion resistance. In the discussion of the various groups of alloys the author presents data on compositions, physical properties, etc.

Vanadium in Cast Iron

Vanadium in Cast Iron and Cast Steel (Vanadin in Gusseisen und Stahlguss), by F. Stadler, *Die Giesserei*, Dusseldorf, Germany, Feb. 23, 1940.

The author discusses the substitution of vanadium for molybdenum and chromium in cast iron, as vanadium can be recovered from German ores. The increased cost of vanadium is offset to some extent by the appreciably more pronounced action of vanadium, so that smaller quantities may therefore be used.

Molybdenum is not a carbide former when added to cast iron in small amounts, while vanadium is an even greater carbide former than chromium. Due to its pronounced carbide forming action, care must be exercised in its use in cast iron and it should not exceed more than 0.2 to 0.3 per cent.

Vanadium improves the tensile strength and wearing qualities of cast iron, making it suitable for cylinder liners of automobile engines, of steam engines for ship propulsion and locomotives. Vanadium-alloyed pistons show a low amount of growth. The sources of vanadium are indicated, reference is also made to the vanadium recovery process patented by R. H. von Seth, its recovery from slags, its application to cast steel, employing manganese-vanadium steel, and the types of ferrovanadium alloys.

Semipermanent Molds

Semipermanent Molds for Nonferrous Casting Production, by Frank Hudson, *Foundry Trade Journal*, London, England. July 18, 1940.

Materials suggested by the author for making semipermanent molds include silicon carbide or graphite base, but only the former is described. It is made up of 97 per cent dry silicon carbide sand (firesand) and 3 per cent concentrated sodium silicate. The sodium silicate is diluted with an equal part of cold water before addition to the silicon carbide, and mixed rapidly to the consistency of green sand. If too dry, temper accordingly. Mixture must be used immediately since drying out decreases final strength of the mold markedly. Greater plasticity can be obtained by the addition of up to 2 per cent bentonite, but presence of clay decreases thermal conductivity and strength after drying. Should addition of clay be necessary, percentage of sodium silicate probably will have to be increased to get adequate dry strength.

Since surface of molds made from silicon carbide is inclined to be rough, desired casting finish must be obtained by treating mold surface with a wash to fill up the small cavities present. A suitable wash can be made from plumbago or graphite made into a cream with water containing 5 per cent sodium silicate. Care should be taken in applying the first dressing as there may be a tendency for the mold surface to soften and rub if the mold drying temperature has not been sufficiently high.

Standard Submitted

A proposed standard on manhole frames and covers for subsurface structures, which has been under consideration since 1935, has been submitted to the American Standards association, 29 West Thirty-ninth street, New York. More than 6000 copies of first draft of the standard were circulated to producers and users, and criticisms and suggestions received were used in preparing the final draft.

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Foundrymen and Metallurgists Co-operate To Advance Industry

By VINCENT DELPORT
European Manager, The Foundry

THE following discussion was presented by Vincent Delport, European manager of THE FOUNDRY, *before the West Riding of Yorkshire Branch of the Institute of British Foundrymen in connection with the presentation of the exchange paper of the American Foundrymen's association on "Development of Some Gating and Feeding Methods for High Duty Alloys," by A. E. Cartwright and C. C. Brisbois, Robert Mitchell Co., Ltd., St. Laurent, Quebec, Canada. As will be recalled, the 1940 meeting of the I.B.F. was cancelled because of the war.*

In transmitting the comments on the paper, Mr. Delport included the following enlightening notes upon the war situation:

"We are all keeping well, although we have all more or less been bombed—with the exception of one of us so far. However, material damage has been slight and personal damage nil. Our office building has been hit near the entrance but our own rooms have escaped damage except for a couple of windows broken in my own room—this happened at night when the premises were empty. We have plenty to eat, despite restrictions on certain foods. All said and done we have lived through 80 days of air raids without feeling much the worse for it and without Hitler getting any nearer to beating us. Unfortunately many people have been killed and wounded, and many more have lost their possessions, and the more this goes on the more we hate the Germans for the way in which they wage this war. Productive capacity here is practically unimpaired."

THE EDITORS

THE paper that has been presented to you is the exchange paper which the American Foundrymen's association contributed to the annual meeting of our institute that should have taken place in Cheltenham, last June. It is perhaps more than a happy coincidence that the joint authors of the paper are two Canadians. Although I have not been specifically commissioned to represent the American Foundrymen's association officially tonight, I am quite certain that the association would wish me to take advantage of this opportunity to extend to you the most cordial greetings of its members, to express the sincere wish for the continued success of our institute despite the difficult conditions under which we are laboring, and, above all, to assure you of the heartfelt sympathy of the American Foundrymen's association for the ordeal that you are going through to a greater or lesser extent, and to express its admiration for the manner in which you are facing the trial.

It sometimes may be difficult for us to understand the official attitude of the United States in regard to this war, but you will all realize that such a large country has many problems of great magnitude to solve and that the authorities must take account of many cross-currents of opinion. But I can assure you that all true Americans feel for us and pray for us. They have shown it in the many ways in which private individuals and collective groups have contributed to the Red Cross, to the proposed evacuation of our children and in many other directions. They are showing it now by the very valuable material help that the administration is lending us with the full concurrence of the large majority of the American people, and I can vouch for it myself by the many letters I receive, which all express kind thoughts for the British people and a strong hope for our victory. I feel I should express these thoughts because I am convinced that real and lasting peace will not return to this world without a common and deep understanding between the American and British people.

I now come to the paper that has been read to you. I do not intend to discuss its technical aspects, but I would like to take it as a text for a few thoughts of general interest to the foundry industry, and I will attempt to give you a very brief summing-up of the paper which, I hope, will contribute to starting the discussion.

In their introductory paragraphs the authors bring to light a certain aspect of the necessary collaboration between metallurgist and foundryman. Among the activities of the metallurgist is the constant

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Foundry Management has, in several notable instances, made its investment dollars go farther under similar circumstances by the simple expedient of seeking the advice and recommendations of an "outside" source in terms of their over-all production requirements and objectives.

They have retained the services of competent foundry engineers—an organization such as ours, having nothing to sell but problem-study and supervision, prejudices neither for nor against; having in mind only such considerations as the present and future demands upon existing facilities. In short, a service to study and analyze how and where a foundry's dollars may be most effectively invested.

You will come closer to receiving your money's worth if you have *all* of the facts and a more adequate interpretation of those facts in terms of your objectives as a competent, outside source with 20 years' experience in the foundry industry can give them to you. Once your needs are known and agreed upon, we can accelerate placing *your plan* into action, thus saving you both valuable time and dollars.

We can service a limited number of foundry accounts in this respect and invite the correspondence of Foundry Management planning a plant expansion, the installation of new equipment, or where a study of present facilities in terms of future requirements is desired. A. A. Wickland & Co., Foundry Engineers, 205 West Wacker Drive, Chicago, Ill.

A. A. Wickland

—Advt.

quest for better castings, not only those secured by using special alloys that give better resistance to wear, heat, etc., but also improved castings made from ordinary iron; more homogeneous castings, less wasters; in general, more regular and more economical production.

The authors are quite aware of the fact that progress along the lines indicated brings about added difficulties in foundry practice and technique. Operation of a foundry equipped for modern production requires a considerable amount of technical knowledge, skill and organization, and there is going to be—there is already—more direct contact between the metallurgist in his laboratory and the foundry manager and molders and melters. That is all for the good.

In connection with this question of collaborating between the research worker and the practician I would like to quote a passage from the address which the late Lord Rutherford, that great New Zealander, delivered when he became president of the British association in 1923:

"If the fundamental researches of the workers in pure science supply the foundations on which the applications are surely built, the successful practical application in turn quickens and extends the interest of the investigator in the fundamental problem, while the development of new methods and appliances required for technical purposes often provides the investigator with the means of attacking still more difficult questions."

Collaboration Gives Results

Results described in the paper that you have before you are due to such collaboration. The time has gone when the so-called *practical man* looked upon the metallurgist as a man solely concerned with science and theory, and far removed from the problems that are found on the cupola platform or at the molding station. It now is a recognized fact that without the patient research work of the metallurgist the industry of castings would not have reached the position of prestige that it has now attained, nor would the iron foundry be able successfully to compete against other forms of fabrication in order to satisfy modern engineering requirements.

On the other hand, it is quite evident that all the work done by metallurgists would be of no avail if foundrymen had not themselves, improved their methods and made the necessary efforts to keep informed of continuous developments. In this connection mention should be made of the facilities afforded today for the distribution of specialized foundry knowledge, and of the opportunities given for the interchange of knowledge by such organizations as our own Institute of British Foundrymen.

With regard to the actual subject of the paper, the methods of feeding described are, no doubt, not unfamiliar to most of you but, apparently, they are not used over here to a very great extent. The authors have made a specialized study of the subject and have successfully translated the results of their experiments into practice. They now place the results before you so that you may benefit by them. This is eminently a practical paper, while being the result of much research work.

Adventures of Bill

(*Concluded from page* 62)

mitted that he always had lived in a rural neighborhood and was very fond of all kinds of domestic animals.

As we approached the shop upon our return, a large black and white cow stepped out through the open doorway. The jaws were moving and the long tongue was licking one nostril and then the other in the manner with which cows attend to little intimate details of the toilet after a hearty meal. In recent years women do a bit of lip stick work under similar conditions and with about the same effect on rude male lookers on.

The patternmaker yelled in alarm and dismay. He and I realized instantly what had happened. I saw my job for next day go glimmering. He started swearing. For a man brought up in quiet rural surroundings, far from the wicked cities he displayed an amazing familiarity with words and phrases usually associated with foundries and other low industrial places where rough uncouth men clothed in fragments of pants and undershirt have developed the verbal art of insult and invective to a high degree of perfection. 'Look at her' sez the lad—this is a free and printable translation—'look at her. The animated lump of uncleanness has eaten my pattern again. She always is doing that!' For a final wish he hoped she would swallow a hedgehog or a grindstone some day and die in great agony. Seemed to me that was carrying vindictiveness too far. I suggested that in future he should close the door. He indignantly refused. His grandfather never had closed the door of the shop. His father never had closed it and by the living patron saint of the parish, so long as he had health and strength, no blinkin' cow was going to make him close the door!

"There y'are," said Bill. "Tune up the old mill. Give 'er a drop of oil and let's get going."

"I knew there was a catch to it some place. There is no market any more for a clean book. I should derive a great deal of pleasure from collecting the stories and, as you say, weaving them into a book, but the gross sales would not buy half a dozen yellow turnips."